HYDROMEDUSAE

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WITH NINE TEXT-FIGURES AND TWO PLATES.

CONTENTS.

INTRODUCTION.

Hydromedusae were taken by the Great Barrier Reef Expedition in almost every pelagic haul, from 27th July, 1928, to 17th July, 1929. The nets used were :

(S) 1 meter stramin net, with 16 strands to the inch.
(C) Coarse silk net, with 58 strands to the inch.
(F) Fine silk net, with 200 strands to the inch.

In the following pages the types of net are indicated by the letters S, C, and F. As a rule the nets were towed obliquely for 30 minutes, and such hauls were taken regularly every week. The majority of the hauls were taken in a locality 3 miles east of the laboratory on Low Isles, a little north of Cairns ; at this locality, referred to as " 3 miles E.," the depth of the water was about 32 m.

Other localities, where Hydromedusae were collected, are as follows :

St. I. 27.vii.28.	2 miles N.E. of Low Isles. Depth 31 m. (2 miles N.E.).
St. IV. 7.viii.28.	1 mile N. of Low Isles. Depth 16 m. Horizontal hauls (1 mile N.).
St. VIII. 24.viii.28.	16° 39′ S. 145° 52′ E. Depth 45 m. (in Trinity Opening—I.T.O.).
St. XI. 6.ix.28.	16° 24′ S. 145° 52′ E. Depth 61 m. (in Trinity Opening—I.T.O.).

	19.ix.28.	Reef flat, entrance to anchorage, Low Isles. (R.F.)
	28.ix.28.	The same.
St. XIX.	20.x.28.	16° 20′ S. 146° 03′ E. Depth 225 m. (outside Trinity Opening—O.T.O.).
St. XX.	20.x.28.	16° 19′ S. 146° 07′ E. Depth more than 600 m. (outside Trinity Opening—O.T.O.).
St. XXVI.	19.xi.28.	16° 24′ S. 145° 53′ E. Depth 57 m. (in Trinity Opening—I.T.O.).
St. XXVIII.	23.xi.28.	16° 19′ S. 146° 05′ E. Depth more than 600 m. (outside Trinity Opening—O.T.O.).
	25.xi.28.	Lagoon over Reef flat (L.O.R.F.).
St. XLIII.	26.ii.29.	15° 16′ S. 144° 26′ 5 E. Depth 30 m. (off Cape Bedford—C.B.).
St. XLIV.	27.ii.29.	14° 44′ S. 145° 27′ 5 E. Depth 31 m. (off Lizard Island—Li.I.).
St. XLV.	28.ii.29.	14° 31′ S. 145° 35′ E. Depth more than 600 m. (outside Cook's Passage—O.C.P.).
St. XLVI.	28.ii.29.	14° 32′ S. 145° 32′ E. Depth 33 m. (inside Cook's Passage—I.C.P.).
St. XLIX.	17.iii.29.	15° 47′ S. 145° 47′ E. Depth 46 m. (inside Papuan Pass—I.P.P.).
St. L.	18.iii.29.	Outside Papuan Pass. Depth more than 400 m. (O.P.P.).

These localities are mentioned in abbreviated form in the lists of occurrence of the species.

At St. XVI, 3.x.28, 3 miles E., a series of six horizontal hauls was made at different depths with a coarse silk net provided with closing apparatus.

I have counted all the specimens in the collection, but the countings of the preserved specimens give no accurate conception of the actual numbers caught in the nets. When a sample contained only a small or moderate number of specimens, all were picked out; but from larger samples the largest and best preserved specimens only were picked out, the remainder being sub-sampled and their numbers calculated. Some few recognizable species were identified on the spot, but in the counts of most samples a considerable number of species are united under the designation "other medusae." The total figures for the collections taken by the stramin net and the coarse silk net have been available to me, and from these I have tried to make a rough estimate of the complete numbers of the most important species at different seasons. We can rely fairly well on the figures given for *Aglaura* and *Liriope*, and these figures are given in the tables. The numbers of specimens of the other species are obtained by dividing up the total number of medusae, other than *Aglaura* and *Liriope*, in proportion to the numbers of preserved specimens of each species. This method is, of course, liable to considerable error, but it gives an approximate idea of the variations in quantity of the most common species during the time of the investigations.

In the tables I have given the estimated average number of specimens per haul with the stramin net and the coarse silk net, combined, in each month for the following species: *Bougainvillia fulva*, *Laodicea indica*, *Phialucium carolinae*, *Eirene hexanemalis*, *Helgicirrha*

malayensis, *Aequorea australis* and *Cunina octonaria*, these being the most abundant species next to *Aglaura hemistoma* and *Liriope tetraphylla*. The samples from the few stations over deep water outside the reefs are not included in the calculations.

The results will be discussed, partly under the separate species, partly in some general remarks on seasonal occurrence.

The collection contains 44 species of Hydromedusae. Two species are not specifically identified (*Eucheilota* sp. I and sp. II). Three are described as new species: *Octotiara russelli* n. g., n. sp., *Phialucium condensum* n. sp. and *Eirene menoni* n. sp.

Only 8 of the 44 species had previously been recorded from Australian waters.

In addition a parasitic Narcomedusan larva is described.

The collection is in the British Museum (Natural History), London.

LIST OF SPECIES.

Anthomedusae.

Leptomedusae.

SYSTEMATIC ACCOUNT.

ANTHOMEDUSAE.

Euphysora bigelowi Maas.

Euphysora bigelowi Maas, 1905, Siboga Exped., **10**, 26, p. 7, pl. 1, figs. 1–3; Maas, 1906, p. 84, pl. 2, figs. 1, 2; Browne, 1916, p. 174; Kramp, 1928, p. 35, figs. 8–12; Kramp, 1948, p. 20.
Euphysa bigelowi, Uchida, 1927, p. 189, pl. 10, fig. 3, text-fig. 28; Uchida, 1947, p. 300.
Steenstrupia bigelowi, Mayer, 1910, p. 36, fig. 9.

This is the type-species of the genus *Euphysora* Maas. The genus is distinguished from *Euphysa* by the fact that one of the four tentacles differs from the others not merely in size but also in structure. A survey of the five species belonging to this genus was given by Kramp (1948).

Material—

St. XXVI, F. 19.xi.28. 1 specimen; height of bell 2·5 mm.
St. XLIV, C. 27.ii.29. 1 specimen; height of bell 4 mm.
St. XLVII, S. 4.iii.29. 2 specimens; height of bell 2–4 mm.
,, C. 4.iii.29. 1 specimen; height of bell 4 mm.
St. XLIX, C. 17.iii.29. 2 specimens; height of bell 2–3 mm.
St. L, S. 18.iii.29. 1 specimen; height of bell 4·5 mm.
St. LVIII, S. 25.v.29. 1 specimen; height of bell 3·5 mm.
St. LIX, C. 31.v.29. 1 specimen; height of bell 3 mm.

With the exception of the specimen from St. XXVI, this species occurred only during late summer and autumn, from February to May.

Distribution.—Euphysora bigelowi is widely distributed in the tropical parts of the Indian and Pacific Oceans, but up to now it has not been recorded from Australia.

Euphysora annulata Kramp.

Euphysora annulata Kramp, 1928, Vidensk. Medd. Dansk. nat. For., **85**, p. 39, fig. 13.

Material:

St. LVIII, S. 25.v.29. 1 specimen; height of bell 3 mm.

This specimen is very like the type-specimen in general shape and has an equally well-developed apical canal. The manubrium is much contracted, being only half as long as the depth of the bell cavity; in the type-specimen the stomach was greatly dilated, because it contained a copepod. This species is distinguished by the main tentacle having complete rings of nematocysts; in the type-specimen there were 17 rings, in the present specimen there are 12 and a well-marked terminal knob. In the type-specimen the ectoderm of the three other tentacles was rubbed off, in the present specimen it is intact, showing that these tentacles are likewise provided with rings of nematocysts. The tentacle opposite the principal one is shorter and thinner than the main tentacle, the rings of nematocysts are very indistinct, about eight in number and almost confluent; the two lateral tentacles have 1–3 indistinct rings each.

Distribution.—The type-specimen was found in Sunda Strait, and it is possible that the medusa from Madras in India mentioned by Menon (1932, p. 6, pl. 1, fig. 8) under the name of "*Sarsia* sp. II" belongs to the same species.

Zanclea costata Gegenbaur.

Zanclea costata + *gemmosa* + *implexa* + *cladophora*, Mayer, 1910, pp. 87–90.

Material.—

St. XLVII, S. 4.iii.29. 1 specimen; 2·5 mm. high.
St. XLVIII, S. 15.iii.29. 2 specimens; 1·5–2 mm. high.
St. L, S, vertical haul 170–0 m. 18.iii.29. 1 specimen, 2 mm. high.

All these specimens have only two, opposite tentacles; the two other marginal bulbs are quite rudimentary.

Distribution.—Atlantic coasts of Europe and North America; the Mediterranean and the Red Sea. Pacific coast of Mexico. Nicobar Islands in the Indian Ocean and Pelew Islands (Palao Islands) in the western Pacific.

Cytaeis tetrastyla Eschscholtz.

It is now generally acknowledged that most of the different forms of *Cytaeis* described from several parts of the three great oceans belong to one species, *C. tetrastyla* Eschscholtz, 1829, including *C. nigritina* and *macrogaster* Haeckel, 1879, and most of the Pacific and Malayan specimens referred to *C. vulgaris*. It is also certain that *C. herdmani* Browne, 1905, belongs to *C. tetrastyla*. *C. pusilla* Gegenbaur, 1856, from the Mediterranean, is doubtful; Browne (1916, p. 177) is inclined to regard it as a valid species. Mayer (1910, p. 133) would use the name of *tetrastyla* only for Eschscholtz' type-specimen, and he employs the specific name *atlantica* Steenstrup, 1837, for the common and widely distributed species. That name was, however, never published by Steenstrup, but is only found in his handwritten catalogue of the collections in the Zoological Museum of Copenhagen. Hartlaub (1911, p. 142) and Browne (1916, p. 177) are inclined to regard *C. vulgaris* Agassiz & Mayer,

from the Fiji Islands, as a distinct species, though they admit that other specimens from the Pacific area belong to *C. tetrastyla*. In a previous paper (Kramp, 1928, p. 44) I considered some specimens from the Philippine Islands examined by me as specifically distinct from *C. tetrastyla*, mainly because their gonads were horseshoe-shaped, and I referred them to *C. vulgaris*. The present specimens from the Great Barrier Reef are all typical *C. tetrastyla*, and none of them have horseshoe-shaped gonads.

The specimens from the Great Barrier Reef are very variable as far as size of tentacle bulbs and development of a stomachal peduncle are concerned ; some of them, which have particularly small tentacle bulbs, agree perfectly with *C. japonica* Uchida (1927, p. 215, pl. 10, fig. 7, text-fig. 39) ; others are intermediate between this latter and the typical *C. tetrastyla*. We may therefore safely state that these two species are identical.

Material.—As seen from Table XVIII, this species was taken almost throughout the period of investigation, from 22nd August, 1928, to 31st May, 1929, in 21 hauls altogether, but never in great abundance. The specimens were all very small, very few being more than 2 mm. in diameter (2·5 mm. at Sts. VII and XLV, 3 mm. at St. LVIII), and there was no distinct difference in the size at different seasons.

Distribution.—*Cytaeis tetrastyla* is widely distributed and very common in the tropical parts of all the oceans. In the Pacific it occurs as far north as the south of Japan, and in the Atlantic north to the vicinity of the Canary Islands ; it also occurs in the Mediterranean. It belongs to the surface layers, but it is not absolutely restricted to the coastal waters, its ability to reproduce by budding enabling it to be carried away by the currents for considerable distances. Though it is very abundant in the Malayan Archipelago it has been recorded from Australian coasts only once before, when a single specimen was found in Torres Strait (Mayer, 1915, p. 200, *Cytaeis atlantica*).

Bougainvillia fulva Agassiz & Mayer.

Bougainvillia fulva Agassiz & Mayer, 1899, Bull. Mus. comp. Zool., Harvard, **32**, p. 162, pl. 2, fig. 6 ; Maas, 1905, p. 10, pl. 1, fig. 8, pl. 2, figs. 9, 10 ; Mayer, 1910, p. 160, 492 ; Kramp, 1928, p. 47, figs. 21–23.

Material.—Taken in 18 hauls between 4th January (St. XXXVI) and 31st May (St. LIX), sometimes in considerable numbers (see Table XVIII), especially in February, when the estimated numbers of specimens per one haul amounted to 55. The seasonal occurrence of this species thus seems to be restricted to the late summer and autumn. Young specimens, 1·5 mm. wide, were taken in January to March ; in April and May the youngest specimens were 2·5 mm. in diameter. The largest individuals, 5–6 mm. wide, occurred in February and March.

Two other species of *Bougainvillia*, *B. prolifera* and *trinema* have been described from Australia (New South Wales, von Lendenfeld, 1884) ; both of them are of doubtful validity. Mayer (1910, p. 171) is inclined to regard *B. trinema* as a young specimen of *B. fulva* ; *B. trinema* is a small medusa with 3 tentacles on each of the marginal bulbs, the oral tentacles have only 3 terminal branches, and the branching is not dichotomous. In the small specimens from the Great Barrier Reef, 1·5 mm. in diameter, with 3 tentacles on each marginal bulb, the oral tentacles are dichotomously divided 2–3 times, each of them with at least 8 terminal branches. If the description of *B. trinema* is correct, its identity with *B. fulva* therefore seems improbable.

The rate of development of the oral and marginal tentacles in *B. fulva* from the Philippine Islands has been discussed by me in a previous paper (Kramp, 1928).

Distribution.—Bougainvillia fulva is a common medusa in the coastal waters of the tropical parts of the Indian and Pacific Oceans. It is particularly common in the Malayan Archipelago, but has also been recorded from as far afield as Djibouti in East Africa, Madras in India, Japan, various islands in the tropical Pacific, and the Pacific coast of Mexico.

Merga violacea Agassiz & Mayer.

Pandea violacea Agassiz & Mayer, 1899, Bull. Mus. comp. Zool. Harvard, **32**, p. 160; Mayer, 1900*b*, p. 34, pl. 1, fig. 1; Bigelow, 1909, p. 205, pl. 41, figs. 10, 11; Mayer, 1910, pp. 119, 490, pl. 11, fig. 7, pl. 12, fig. 1.
Merga violacea, Hartlaub, 1913, p. 249, fig. 204; Menon, 1932, p. 7, pl. 1, fig. 10.
Mergintha lobianci Hartlaub, 1913, p. 250, fig. 205.

Material.—

St. XXII, C. 23.x.28. 2 specimens; diam. 3–4 mm.
St. XXXII, S. 5.xii.28. 2 specimens; diam. 4 mm.
St. XXXIV, C. 19.xii.28. 1 specimen; diam. 2 mm.
St. XXXV, S. 27.xii.28. 3 specimens; diam. about 4 mm.
,, C. 27.xii.28. 6 specimens; diam. 3–5 mm.
St. XXXVII, C. 14.i.29. 4 specimens; diam. 3–4·5 mm.

The only difference between *Merga violacea* and *Mergintha lobianci* is the possession of frilled lips in the latter. The largest specimen from St. XXII, which is 4 mm. wide and 6 mm. high, likewise has frilled lips. It has 8 fully developed tentacles and 3 small rudiments between each successive pair of tentacles; the other specimen from the same station, 3 mm. wide, has also 8 tentacles. One of the specimens from St. XXXVII, 4·5 mm. wide, has 10 tentacles.

On the Great Barrier Reef the occurrence of this species was restricted to a fairly short period.

Distribution.—"*Mergintha lobianci*" has only been found near Capri in the Mediterranean. *Merga violacea* seems to have a wide distribution, though it has only been observed on few occasions: Tortugas (Florida) and the Bahamas in the Atlantic, west coast of Mexico and Fiji Islands in the Pacific, and Madras in the Indian Ocean.

Amphinema dinema (Péron & Lesueur).

Amphinema dinema, Browne, 1896, p. 475 (with previous references); Menon, 1932, p. 8, pl. 1, fig. 7.
Stomotoca apicata Mayer, 1910, p. 109, pl. 9, figs. 8–10, pl. 10, figs. 1–4.

Material.—

St. XV, C. 2.x.28. 1 specimen; diam. 2 mm.
St. XXV, S. 16.xi.28. 2 specimens; diam. 1·8 mm.
,, ? 16.xi.28. 2 specimens; diam. 2 mm.
St. LI, C. 25.iii.29. 6 specimens; diam. 1·5–2 mm.
St. LIV, C. 20.iv.29. 1 specimen; diam 1·5 mm.
St. LIX, C. 31.v.29. 1 specimen; diam. 3 mm.

These specimens agree so perfectly with the North-European *A. dinema* that I do not hesitate to refer them to the same species. There are three rudimentary marginal bulbs

in each quadrant, besides the two perradial ones, and they are all very small, slightly conical, and have no ocelli.

The occurrence of this species on the Great Barrier Reef was very scattered.

Distribution.—Amphinema dinema occurs in the coastal waters of north-western Europe and the Atlantic coast of North America. The medusa from Amirante Islands in the western part of the Indian Ocean described by Browne (1916, p. 181) as *Amphinema* sp. probably belongs to the same species, and I also feel sure that the record by Menon (1932) of *A. dinema* as occurring near Madras in India is correct. This species thus seems to have an extensive distribution, though apparently it is fairly rare within all the areas, whence it has been recorded.

Octotiara nov. gen.

Pandeidae with 8 radial canals ; with a well-developed stomachal peduncle ; with transversely folded gonads ; without mesenteries.

Octotiara russelli n. g., n. sp.

(Plate I, figs. 1–3).

Material.—

St. L, C. 18.iii.29. 1 specimen.

Description (figs. 1–3).—The umbrella of the single specimen is somewhat crumpled and the margin turned inwards ; apparently it has been watchglass-shaped or perhaps approximately hemispherical ; it is 7 mm. in diameter in its present condition. Mesogloeal jelly fairly thin. There is a stout and broad gelatinous stomachal peduncle, a barrel-shaped stomach carrying the gonads, and a long mouth tube destitute of gonads. The length of the entire manubrium is 7 mm., of which the peduncle, the stomach and the mouth tube make about one-third each. The 8 radial canals are fairly narrow, with smooth edges, and the circular canal is very narrow. The peduncle is nearly circular in transverse section, whereas the stomach is longitudinally folded with 8 deep, interradial furrows and 8 prominent perradial edges, which are continued along the sides of the mouth tube. The mouth has 8 short, simple, triangular lips with a slightly frilled margin.

The gonads are placed along each side of the perradial edges of the stomach, deeply transversely folded, each with 6–8 folds.

There are 8 large, perradial tentacles, spirally coiled, finely transversely wrinkled, and densely beset with nematocysts throughout their length. The basal bulbs are conical, distinctly heart-shaped on the adaxial side and with a slight indication of an abaxial spur. There are no ocelli. In each of the spaces between the tentacles there are 8 minute marginal warts.

The velum is narrow and delicate.

Colour as preserved in formalin : stomach, gonads, and tentacular bulbs yellowish-brown, rudimentary marginal bulbs nearly colourless.

I have great pleasure in naming this interesting new species after my friend F. S. Russell, Director of the Marine Laboratory, Plymouth, formerly zoologist on the Great Barrier Reef Expedition.

The most striking feature of this species is the possession of 8 radial canals never

observed in any other members of the family Pandeidae. In several details it resembles the species of the genus *Stomotoca* (*sensu strictu*), which have likewise a well-developed stomachal peduncle, transversely folded gonads, and a number of minute rudimentary bulbs upon the umbrella margin. The shape of the tentacle bulbs is also very similar in the two genera, which are evidently closely related. The number of radial canals and fully developed tentacles, however, distinguishes the present species from *Stomotoca*, which has only 2 tentacles and 4 radial canals.

Leuckartiara octona (Fleming).

For the complicated synonomy of this species, see Hartlaub, 1913, p. 285.

Material.—Taken in 14 hauls at 12 stations between 3rd October, 1928 (St. XVI), and 17th March, 1929 (St. XLIX) (see Table XVIII).

Only young specimens were found, ranging in size from 1 to 3 mm. in diameter.

Distribution.—Very abundant in the coastal waters of north-western Europe, and also found in the Mediterranean and off the Atlantic coast of North America. Also recorded from several localities in the Pacific and Indian Oceans and the Malayan Archipelago, but now for the first time taken in Australian waters.

Leuckartiara gardineri Browne.

Leuckartiara gardineri Browne, 1916, Trans. Linn. Soc. London (2), Zool. **17**, p. 181, pl. 39, fig. 4.

Material.—

St. XXXV, S. 27.xii.28. 1 specimen; diam. 4 mm.
St. XLVI, S. 28.ii.29. 1 specimen; diam. 2 mm.

The specimen from St. XXXV is much crumpled, and the stomach as well as the umbrella are turned inside out. It has four perradial tentacles and 5–6 minute bulbs in each of the four quadrants.

The most characteristic structures in this species are the 4 conspicuous exumbrellar, canal-like bands extending from the tentacles nearly to the summit of the umbrella (Browne, 1916); Bigelow (1918, p. 375) is inclined to think that they are canals like the 8 exumbrellar ribs in his new species *Eutiara mayeri*. Owing to the scarcity of the material I have not cut sections of the present specimens; the 4 exumbrellar bands are very conspicuous, and as far as I am able to see in optical section they really seem to be hollow.

Distribution.—One single individual was found at the Amirante Islands in the western part of the Indian Ocean.

Cirrhitiara superba (Mayer).

Tiara superba Mayer, 1900*b*, Bull. Mus. comp. Zool. Harvard, **37**, p. 34, pl. 16, fig. 39; Mayer, 1904, p. 8, pl. 2, fig. 11.
Turris pileata var. *superba* Mayer, 1910, p. 126, pl. 27, fig. 8, pl. 28, figs. 3, 4; Vanhöffen, 1913, p. 416.
Cirrhitiara superba, Hartlaub, 1913, p. 284, fig. 237; Thiel, 1938, p. 296, fig. 2.

Material.—

St. XXXII, S. 5.xii.28. 1 specimen; diam. 5 mm.
St. XXXV, S. 27.xii.28. 1 specimen; diam. 4 mm.

In the specimens from the Tortugas and the Bahamas described by Mayer in the three papers quoted above there were 3 rudimentary marginal bulbs, all of about equal size, in each quadrant; the characteristic cirri, one beside each rudimentary bulb, were not mentioned in his descriptions, but they are seen in the figure (1910, pl. 28, fig. 3). The presence of these cirri induced Hartlaub (1913) to establish a new genus for this medusa, which in most other respects agrees with *Leuckartiara*.

The specimens from the Great Barrier Reef differ from the original description of the species in that the interradial marginal bulbs are somewhat larger than the adradial ones and clasp the margin of the umbrella; moreover they are destitute of cirri. In specimens from the tropical Atlantic, however, the interradial bulbs may sometimes develop into true tentacles, though smaller than the perradial ones, as observed by Vanhöffen (1913) and Thiel (1938), so that the present specimens may be regarded as transitional stages and not as representatives of a new species. In all other respects they agree perfectly with the descriptions of *C. superba*.

Distribution.—Tortugas (Florida), Bahamas, and the coast of Brazil.

Heterotiara minor Vanhöffen.

Heterotiara minor Vanhöffen, 1911, Wiss. Ergeb. deutsch. Tiefsee Exp. **19**, p. 212, pl. 22, fig. 5, text-fig. 8*a*, *b*; Browne, 1916, p. 183; Bigelow, 1919, p. 287, pl. 39, fig. 9, pl. 40, figs. 2–4; Kramp, 1928, p. 58, figs. 27–30.

Material.—

St. XLIV, C. 27.ii.29. 2 specimens; height of bell 2·5 mm.

One of the specimens, a female, is fairly well preserved; the other specimen, with male gonads, is much crumpled, and there are some irregularities in the course of its radial canals, but owing to the state of preservation these anomalies can not be properly described. The gonads of the female specimen contain fairly large eggs. On account of their small size both specimens must, however, be regarded as young stages. Both of them have 8 tentacles.

There is no indication of a differentiation of the radial canals into an upper narrow portion and a lower portion "suddenly slightly widened and ragged on the edge," which should be characteristic of the genus *Kanaka* (Uchida, 1947, p. 303) with the Japanese species *K. pelagica* Uchida. The latter is a small medusa, 1·8 mm. high, with 8 tentacles, so much like a small *Heterotiara* that I am inclined to think that the differentiation of the radial canals is due either to abnormal development or to the state of preservation of the single specimen observed.

Distribution.—*Heterotiara minor* has been found in the Indian Ocean near the Nias and the Cocos-Keeling Islands and north of Chagos, in several localities around the Philippine Islands, and near Hong Kong. Its area of distribution is now extended to the north-east coast of Australia.

Leptomedusae.

Laodicea indica Browne.

Laodice indica Browne, 1905, Ceylon Pearl Oyster Fish., Supp. Rep. **27**, p. 136, pl. 1, fig. 5, pl. 4, figs. 7–11; Browne, 1907, p. 466.

Laodicea cruciata Mayer, 1910, p. 202 (part).

Probably also:

Laodice fijiana var. *indica*, Maas, 1905, p. 25, pl. 2, figs. 14, 15, pl. 5, figs. 32–35.
Laodice fijiana, Maas, 1906, p. 89.
Laodice maasii Browne, 1907, p. 466; Vanhöffen, 1911 p. 221, fig. 14.
Laodicea fijiana, Mayer, 1910, p. 205 (part).
Laodicia fijiana, Mayer, 1915, p. 200.

The limitation of the various species of *Laodicea* which have been described is very difficult, partly owing to the considerable variability of these medusae, partly because the description of some of the species was based on juvenile specimens. We may state without doubt that *L. pulchra* Browne, which has only been found at the Falkland Islands, is a distinct species; it was established by Browne (1902, p. 280), and further described and figured by Browne & Kramp (1939, p. 291, pl. 16, figs. 3–5). Several authors regard all the other species as synonyms or varieties of *L. undulata* (Forbes & Goodsir, 1851). I have previously been of the same opinion (Kramp, 1919, pp. 22 et seq.), but since I have seen specimens from various parts of the world, it seems to me a safer course to keep four or five species separate, at least provisionally. The Atlantic and Mediterranean forms probably all belong to *L. undulata*, but the Indo-Pacific forms are more or less distinct. The two species *L. marama* and *fijiana* Agassiz & Mayer (1899) have never been found since they were recorded from the Fiji Islands, where both of them were common. *L. marama* differs from all other Indo-Pacific forms by its large number of cordyli, usually 2–3 between each successive pair of tentacles, and by the possession of an ocellus upon the bulb of most of the tentacles. *L. fijiana* seems to be well characterized by the gonads being situated upon complex diverticulae of the radial canals. At any rate, Maas (1905 and 1906) and Mayer (1910 and 1915) were entirely wrong in identifying specimens from the Malayan Archipelago and Torres Strait as *L. fijiana* and considering *L. maasi* Browne a synonym of *fijiana*.

L. indica Browne was described from two localities on the west coast of Ceylon. I have seen the type-specimen in the British Museum, and I consider it beyond doubt that the numerous specimens taken on the Great Barrier Reef expedition belong to the same species. Cordyli are present in about the same number as the tentacles, and there is an ocellus upon the basal part of almost every second tentacle, notwithstanding the stage of development of the specimens. In *L. indica* the tentacles are said to be destitute of a basal spur; in the specimens from the Great Barrier Reef an abaxial spur is actually present in the young tentacles, but it is difficult to see, and during the growth of the tentacle the abaxial side of its basal part is pushed upwards on the outer side of the umbrella margin engulfing the spur, which at last entirely disappears, just as was described in *L. undulata* (Kramp, 1919, p. 18).

The name of *L. maasi* was proposed by Browne (1907) for the Malayan medusa described by Maas (1905) as *L. fijiana* var. *indica*. It is a somewhat larger medusa than *L. indica*, and Maas was unable to find cirri in his specimens. On the other hand, basal spurs were present on the tentacles. Cirri are, however, readily lost; in the specimens from the Great Barrier Reef some few cirri can be found by careful examination; presumably they were present in greater numbers before the preservation of the specimens. Although Maas was unable to find cirri in *L. maasi* and Browne failed to observe tentacular spurs in *L. indica*, I consider it most probable that both structures are actually present in both species, which in other respects are very similar to one another. The presence of spurs as well as cirri

in the Great Barrier Reef specimens seems to me to support the supposition that *L. maasi* is identical with *L. indica*.

Material.—Laodicea indica occurred on the Great Barrier Reef throughout almost the whole period of investigation, from 22nd August, 1928 (St. VII), to 7th June, 1929 (St. LX). It was particularly common in November and December, when it was sometimes found in great abundance (see Table XVIII). The estimated average numbers of specimens per one haul in December was more than 500.

TABLE I.—*Seasonal Occurrence of* Laodicea indica.

Month.	VII.	VIII.	IX.	X.	XI.	XII.	.	I.	II.	III.	IV.	V.	VI.	VII.
Estimated average number of specimens per one haul	0	0·5	2	3	19	555	.	9	3	6	0	1	2	0
Diameter of umbrella (mm.)	–	2–5·5	3–5	2·5–9	2–10	2–10	.	4–6	4–8	1–6	–	3	3–6	–

As will be seen from the adjoining table (Table I), young specimens were taken at all seasons, but specimens of larger size, more than 8 mm. in diameter, were only found during the summer months. The largest individuals measured 10 mm. in diameter and possessed about 150 tentacles. They occurred in November and December, at the time when the species was particularly abundant in the samples.

Distribution.—Laodicea indica, as described by Browne (1905), has only been found on the west coast of Ceylon, but *L. maasi*, which is probably the same species, was taken by the " Siboga " expedition in several localities in the Malayan Archipelago (Maas, 1905), and has also been recorded from Amboina (Maas, 1906), the Gulf of Aden (Vanhöffen, 1911), and from a locality off Maër Island in Torres Strait, where it was quite common in September and October (Mayer, 1915).

Eucheilota sp. I.

Material.—Entrance to anchorage, Low Isles, 28.ix.28, coarse silk net. One juvenile specimen.

The specimen is 4 mm. in diameter ; the gonads are hardly visible as tiny dilatations in the middle parts of the radial canals. There are 4 perradial and 4 interradial tentacles and 24 small rudimentary marginal bulbs, 8 adradial and 16 eradial. The tentacles and the rudimentary bulbs are all flanked by one pair of lateral cirri. Eight marginal vesicles.

This may possibly be a young stage of *Eucheilota ventricularis* McCrady, which is common on the Atlantic coast of North America, and also has been recorded from the Red Sea and the Chagos Islands in the Indian Ocean. There are, however, several other possibilities, and I prefer therefore to leave the question of the specific identity of this young medusa open.

Eucheilota sp. II.

Material.—

St. LII, S. 6.iv.29. 1 specimen.

It is a pity that the single specimen is in a poor state of preservation, crumpled and covered with debris which impede a satisfactory examination of the structure of this little

medusa, apparently a form of some interest. The umbrella is 3 mm. in diameter, with thin walls. The stomach is somewhat elongated, containing a doubled-up *Sagitta* with head and tail protruding from the mouth of the medusa. Small, oval immature gonads are situated in the middle portion of the 4 narrow radial canals. There are 8 marginal tentacles with conical basal bulbs, and also one or two young marginal bulbs and some few minute wart-like protuberances. There are no lateral cirri on the tentacle bulbs, but between adjacent tentacles there are a number, apparently 6–8, of spiral cirri and about 4 small, closed marginal vesicles.

The only species of *Eucheilota* which bears some resemblance to the present form is *E. bermudensis* (Fewkes), which occurs on the coasts of Florida and the Bermudas. According to the description of this species, each of the 8 tentacle bulbs is flanked by a pair of lateral cirri (Mayer, 1910, p. 282), but in the figure (pl. 38, fig. 3) these cirri are distinctly separated from the tentacle bulbs. All other species of *Eucheilota* have only lateral cirri adjacent to the marginal bulbs, and each of the so-called marginal cirri in *E. bermudensis* is placed immediately beside a small rudimentary marginal bulb, and they should really be termed lateral cirri attached to these minute bulbs. In the specimen from the Great Barrier Reef some of the cirri are apparently independent of the minute wart-like protuberances and somewhat more numerous than these latter, but owing to the state of preservation I am unable to determine the relation between the cirri and the warts. I do not venture, therefore, to refer this Australian medusa to the Atlantic species *Eucheilota bermudensis*.

Phialidium hemisphaericum (L.).

Material (see also Table XVIII).—

St. XIII, S. 20.ix.28. 1 specimen.
St. XXVI, F. 19.xi.28. 1 specimen.
St. XXVII, S. 21.xi.28. 1 specimen.
Lagoon over reef flat, 25.xi.28. 4 specimens.
St. L, S. 170–0 m. 18.iii.29. 3 specimens.

These specimens are in every respect indistinguishable from the common European medusa *Phialidium hemisphaericum*, and as the corresponding hydroid, *Campanularia johnstoni*, has a very extensive distribution and has even been recorded from New Zealand and the Malayan Archipelago, it is not astonishing to find the medusa on the Australian coast.*

Ten specimens of this medusa were taken on the Great Barrier Reef at different seasons; all of them were rather small. The numbers of tentacles and young tentacular bulbs were as follows:

Diam. mm.	2	2	3	3	4	5	5·5	6	6	6
Tentacles	*c.* 8	12	14	16	17	17	*c.* 22	23	24	*c.* 32
Young bulbs	*c.* 8	4	2	2	4	*c.* 5	2	0	2	?

Distribution.—European waters from southern parts of Norway and Iceland into the Mediterranean.

* On the "Galathea" expedition 1951 I found this medusa in several localities between India and the Philippine Islands, and the Danish "Atlantide" expedition in 1946 has collected it on the west coast of Africa.

Phialidium simplex Browne.

Phialidium simplex Browne, 1902, Ann. Mag. nat. Hist. (7), **9**, p. 282 ; Browne, 1908, p. 236 ; Mayer, 1910, p. 274 ; Thiel, 1938, p. 328 ; Browne & Kramp, 1939, p. 299, pl. 17, figs. 5–9 ; Kramp, 1948*a*, p. 5.
non *Phialidium simplex* Uchida, 1947, p. 305.

Material (see also Table XVIII).—

St. I, C. 27.vii.28. 2 specimens.
St. IX, S. 31.viii.28. 1 specimen.
St. XI, C. 6.ix.28. 1 specimen.
St. LVII, S. 18.v.29. 4 specimens.
„ C. 18.v.29. 1 specimen.
St. LVIII, S. 25.v.29. 8 specimens.
St. LIX, S. 31.v.29. 3 specimens.
„ C. 31.v.29. 2 specimens.

All the specimens are small, ranging in size between 2·5 and 5 mm. in diameter, but they agree very well with the intermediate stages of *P. simplex* from the Falkland Islands, with the exception that they have a greater number of tentacles. This species was briefly described from the Falkland Islands by Browne (1902), who also recorded a single specimen from the same locality in 1908 ; a full description was given by Browne & Kramp (1939). In this description it was emphasized that " the number of tentacles is very variable and is not correlated with the size of the umbrella, nor the size of the gonads." In spite of the relatively great number of tentacles in the specimens from the Great Barrier Reef, I therefore do not hesitate to refer them to the same species, as in all other respects the agreement is perfect, and no other species of *Phialidium* is likely to be confounded with it.

Remarks on the specimens from the Great Barrier Reef.—

Diam. (mm.).	Number of tentacles.	Length of gonads in relation to radial canals.	Number of specimens examined.
2·5	44–46	$\frac{2}{3}$	2
3	38–50	$\frac{1}{2}$–$\frac{2}{3}$	4
3·5	42–48	$\frac{1}{2}$	2
4	41–52	$\frac{1}{3}$–$\frac{4}{5}$	8
4·5	*c.* 50	$\frac{3}{4}$	2
5	54	$\frac{3}{4}$	1

At the Falkland Islands the medusa may attain a size of 22 mm. in diameter, with 60–85 tentacles and a few young tentacular bulbs. The basal bulbs of the tentacles are globular, nearly as broad as the spaces between them. In all the specimens examined there are only few young bulbs. One statocyst between successive tentacles. In one of the specimens 4 mm. wide the gonads contain well-developed eggs.

As in the specimens from the Falkland Islands abnormalities are of rather frequent occurrence in the Great Barrier Reef specimens. One specimen, 3 mm. wide, has 3 radial canals, another (5 mm. wide) has 5. In one specimen, 4 mm. wide, the stomach is 5-rayed,

but the fifth radial canal is not developed. In one specimen two of the gonads are connected by a transverse anastomosis.

Distribution.—Phialidium simplex is very abundant from November to March at the Falkland Islands, whence it has been recorded by Browne (1902 & 1908), Browne & Kramp (1939) and Kramp (1948*a*). According to Thiel (1938) a small specimen has also been taken on the Patagonia Bank, off the east coast of South America, about 30° S., and I think the identification is correct.

On the Great Barrier Reef some few specimens were taken in July to September, 1928, and several in May, 1929, whereas the medusa was completely lacking during the intervening period.

Phialidium rangiroae (Agassiz & Mayer).

Epenthesis rangiroae Agassiz & Mayer, 1902, Mem. Mus. comp. Zool. Harvard, **26**, p. 145, pl. 1, fig. 4.
Clytia rangiroae, Mayer, 1910, p. 165.

Material.—

St. XIV, S. 26.ix.28. 1 specimen.

The specimen is 4 mm. in diameter, thin and flat. It has 12 tentacles with small globular bulbs and also one tiny young bulb in each quadrant. About 16 very small statocysts. The gonads, male, are short and oval, situated very near the ring-canal. The stomach is very small, quadrate, not cross-shaped, and the mouth has 4 small, simple lips.

Distribution.—Rangiroa Island, Paumotus, South Pacific.

Phialidium sp.

The following specimens from St. XXXII, 5.xii.28, probably belong to *Phialidium*, but could not be identified.

Diam. 2·5 mm. ; 12 tentacles ; fairly large stomach.

Diam. 7 mm. ; about 30 tentacles ; no young bulbs. Gonads linear, near stomach.

Diam. 8 mm. ; 16 tentacles and 14 young bulbs ; one statocyst between tentacles and bulbs. Gonads linear, in middle parts of radial canals ; stomach lost.

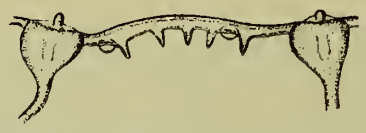
Genus *Phialucium* Maas.

The name *Phialucium* was introduced by Maas (1905) as a subgenus of *Phialidium* to include *Oceania virens* Bigelow (1904), *Mitrocoma mbenga* Agassiz & Mayer (1899), and *Oceania carolinae* Mayer (1900*a*). Bigelow (1909) and Mayer (1910) elevated it to the rank of a genus, and Bigelow added a new species, *P. comata*, which, however, has cirri and is a *Phialopsis*.

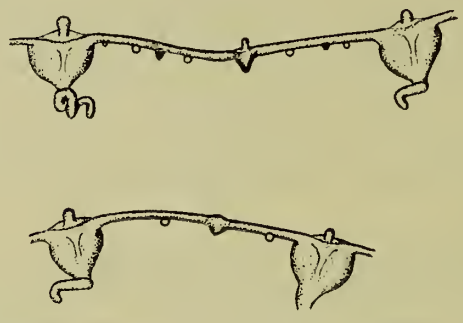
Phialucium is generally stated to differ from *Phialidium* by the possession of permanently rudimentary tentacle-bulbs on the bell margin, but there is another and far more characteristic difference : in contradistinction to *Phialidium* the tentacle-bulbs of *Phialucium* have excretory pores mounted upon well-developed papillae. As demonstrated below, the small marginal bulbs are not always permanently rudimentary.

The limitation of the species has been discussed by several authors. Maas (1905, 1906 & 1909) was inclined to think that *Mitrocoma mbenga* Agassiz & Mayer and *Phialidium tenue* Browne were identical with *Phialucium virens*. Bigelow (1909) came to the same

conclusion. Mayer (1910) likewise regarded *P. mbenga* as probably identical with *P. virens*, but agreed with Browne (1905) that *Phialidium tenue* is probably an abnormal specimen of *Irenopsis hexanemalis*. Hartlaub (1909) was inclined to think that also *P. virens* and *mbenga* were aberrant specimens of *Irenopsis hexanemalis*. Vanhöffen (1911) regarded *P. carolinae* as possibly a stunted form of *P. mbenga* (= *P. virens*). Bigelow (1919) has thoroughly studied the various species, counting tentacles, rudimentary bulbs and statocysts, and arrives at the conclusion that *P. carolinae* is a distinct species, restricted to the Atlantic region, and mainly characterized by its great number of statocysts, whereas he unites the Indo-Pacific forms *mbenga* and *virens*, because there is no discontinuity between their relative numbers of marginal organs. Stiasny (1928) agrees with him in this respect. Menon (1932) added a new species, *P. multitentaculata*. Uchida (1947) records *P. carolinae* from the Pelew Islands, and that is the first record of this species from the Pacific. As mentioned below, I consider the vast majority of the numerous specimens from the Great Barrier Reef belong to that species.



TEXT-FIG. 1.—*Phialucium mbenga*, St. L. Margin of umbrella. × 35.



TEXT-FIG. 2.—*Phialucium carolinae*, St. XXXIX. Margin of umbrella. × 35.

Bigelow (1919) carefully counted the rudimentary marginal bulbs in his specimens of *Phialucium*, but he paid no attention to the size of the bulbs, and that is really where we find the distinguishing mark between *P. mbenga* and the other species. In *P. mbenga*, as it is described by Agassiz & Mayer (1899), Maas (1905 as *P. virens*), and Vanhöffen (1911), and as I have seen it in the collection from the Great Barrier Reef (Text-fig. 1) the rudimentary bulbs between the tentacles are all alike, tenon-like or slightly conical, of equal size, and they are really " permanently rudimentary." They are also, as a rule, present in somewhat larger numbers than in the other species. In *P. carolinae*, as figured by Mayer (1900*a*, pl. 3, fig. 9, and pl. 4, fig. 11; 1910, pl. 36, fig. 1′) and in the numerous specimens from the Great Barrier Reef (Text-fig. 2), the number of rudimentary bulbs between successive tentacles is usually 3, and the median one is distinctly larger than the others and is frequently seen in the act of developing into a true tentacle. Also in *P. multitentaculata* Menon (1932) the median rudiment in each space between the tentacles is larger than the two or three other ones. *P. carolinae* is also distinguished by its greater number of statocysts.

The original specimens of *P. virens* (Bigelow, 1904) from the Maldive Islands are distinctly different from *P. carolinae*, and Bigelow (1919) and the other authors mentioned above may be right in referring them to *P. mbenga*, and placing the name *P. virens* in the synonymy. On the other hand, it seems to me most probable that the octoradial form from the Philippine Islands, described by Bigelow (1919) as *P. mbenga* var. *polynema*, is identical with the polyradial form of *P. carolinae*, of which I have found numerous specimens in the collection from the Great Barrier Reef and which will be described below. The same probably applies to the following medusae: *Octocanna polynema* Browne, 1905, Maas, 1905 (but not Maas, 1906), and Menon, 1932. *Phialidium heptactis* Vanhöffen, 1911, and *Phialidium phosphoricum* forma *polynema* Vanhöffen, 1912*b*. *Octocanna polynema* Bigelow, 1909, from the coast of Mexico, is a different species.

"*Phialidium tenue*" Browne, 1905, which has a short but distinct stomachal peduncle, does not belong to the genus *Phialucium* as has been supposed by some authors, and the various forms of *Pseudoclytia*, with 5 radial canals, are most probably abnormal specimens of *Phialidium*.

Phialucium mbenga (Agassiz & Mayer).

Mitrocoma mbenga Agassiz & Mayer, 1899, Bull. Mus. comp. Zool. Harvard, **32**, p. 168, pl. 8, figs. 24, 25.
? *Oceania virens* Bigelow, 1904, p. 252, pl. 1, figs. 3, 4.
Phialucium virens, Maas, 1905, p. 32, pl. 6, figs. 36, 37.
Phialucium mbenga, Mayer, 1910, p. 276: Vanhöffen, 1911, p. 225, pl. 22, fig. 12, text-fig. 16.
? *Phialucium mbenga*, Stiasny, 1928, p. 208.
? *Phialucium virens*, Maas, 1906, p. 93; Mayer, 1910, p. 276, text-fig. 149.

Material (see also Table XVIII).—

St. XV, F. 3 miles E. 2.x.28. 1 specimen; 7 mm. wide.
St. XIX, S. 180–0 m. O.T.O. 20.x.28. 1 specimen; 9 mm. wide.
„ N. 180–0 m. O.T.O. 20.x.28. 1 specimen; 11 mm. wide.
St. XX, N. 250–0 m. O.T.O. 20.x.28. 1 specimen; 12 mm. wide.
St. XLV, S. 500–0 m. O.C.P. 28.ii.29 1 specimen; 6 mm. wide.
St. XLIX, S. I.P.P. 17.iii.29. 2 specimens; 5–7 mm. wide.
„ C. I.P.P. 17.iii.29. 1 specimen; 6 mm. wide.
St. L, S. 170–0 m. O.P.P. 18.iii.29. 1 specimen; 8 mm. wide.

This species was fairly rare in the collection, and it was taken in two separate periods, October, 1928, and February–March, 1929. Only on one occasion (St. XV) was it taken at the fixed station, 3 miles east of Low Isles, all the other catches are from the outside waters or (St. XLIX) from one of the channels between the reefs, and mainly in vertical hauls from considerable depths. It seems probable, therefore, that this species mainly occurs in the deeper strata.

As mentioned above *P. mbenga* is distinguished by the rudimentary marginal bulbs being tenon-like and of equal size; moreover the rudimentary bulbs are not provided with an adaxial excretory papilla (Text-fig. 1). In the present specimens their number varies between 4 and 9 between two successive tentacles. The excretory papillae of the tentacle-bulbs are conspicuous. The specimen from St. XV, 7 mm. in diameter, has 11 tentacles; all the other specimens have 16. As a rule there are two statocysts between adjacent tentacles. The number of radial canals is always four, but one specimen (St. XIX, 11 mm.

wide) is slightly abnormal, in so far as one of its radial canals communicates with the ring-canal very near one of the other canals.

Distribution.—Fiji Isles (Agassiz & Mayer); Malayan Archipelago (Maas); north point of Sumatra (Vanhöffen). If the determination by Stiasny is correct, it has also been taken in Java Sea and near Singapore. *P. virens* is recorded from the Maldive Islands (Bigelow, 1904) and Amboina (Maas, 1906).

Phialucium carolinae (Mayer).

Oceania carolinae Mayer, 1900*a*, Bull. Mus. comp. Zool. Harvard, **37**, p. 7, pl. 3, fig. 9, pl. 4, figs. 10, 11.
Octocanna polynema Browne, 1905, p. 144, pl. 2, figs. 8–10; Maas, 1905, p. 38; Menon, 1932, p. 23, pl. 3, fig. 25.
Phialucium carolinae, Maas, 1905, p. 32; Bigelow, 1909, p. 157; Mayer, 1910, p. 275, pl. 36, fig. 1′, 1″; Uchida, 1947, p. 307.
Phialidium heptactis Vanhöffen, 1911, p. 225, text-fig. 15, pl. 22, fig. 11.
Phialidium phosphoricum f. *polynema*, Vanhöffen, 1912*b*, p. 19.
Phialucium mbenga, Bigelow, 1919, p. 295.
Phialucium mbenga var. *polynema*, Bigelow, 1919, p. 296, pl. 41, fig. 8.
? *Phialucium mbenga*, Stiasny, 1928, p. 208.

Material.—The present material of this medusa consists of 290 specimens taken within the period 30th July, 1928, to 6th June, 1929 (see Table XVIII and the discussion below).

Remarks on the Morphology.—Most of the specimens have 4 radial canals, but the number of canals varies from 2 to 9, a considerable number of specimens having 6, 7 or 8 (see below). Apart from this numerical variation the individuals are all alike in morphological respects.

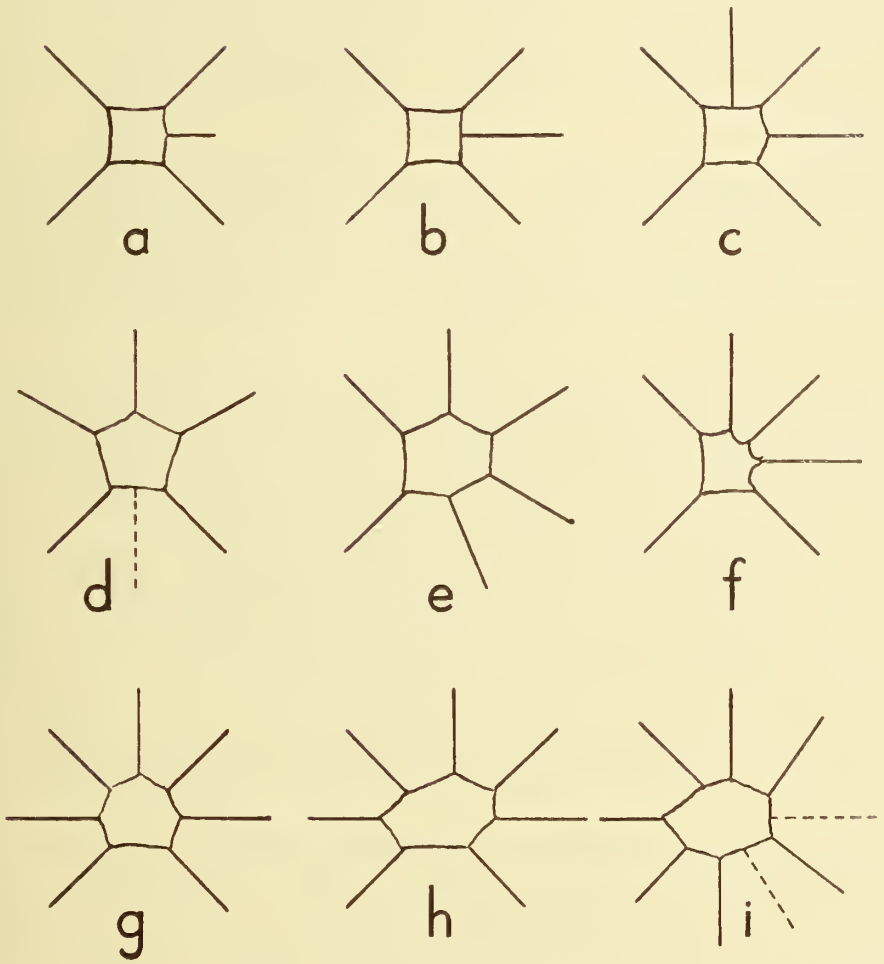
The mesogloeal jelly of the umbrella is fairly thick, sometimes very much so. The base of the stomach is broad and quadrate, the stomach is short, and the mouth is provided with long, pointed, frilled lips. Originally there are 4 lips corresponding to the 4 primary radial canals, but when a greater number of radial canals is developed, the supernumerary canals are secondary, frequently issuing from the sides of the stomach in an irregular way; and simultaneously with the development of the secondary canals the shape of the stomach is altered, and the lips are cleft, but the final number of lips is not always the same as the number of radial canals. As seen from the adjacent diagrams (Text-fig. 3) a secondary canal frequently takes its origin from the side of the still square stomach between two of its corners, afterwards drawing the stomach-wall outwards, so that in the end the base of the stomach attains a more or less regular star-shaped outline. Some of the secondary canals may be seen ending blindly at some distance from the stomach (Text-fig. 3*a*), or they may be distinctly narrower than the others (Text-fig. 3*d* and *i*). This latter is the only specimen I have seen with as many as 9 radial canals. There is a marginal tentacle opposite the end of each of the 4 primary radial canals, but not always at the termination of the secondary canals.

Among 253 specimens, in which I have counted the radial canals, I found the following numbers:

Number of radial canals	2	3	4	5	6	7	8	9
Number of specimens	2	3	165	5	13	37	27	1

Thus altogether 65% had 4 canals, 25% had 7 or 8 (most of them 7), and only 7% had 5 or 6. According to the size of the specimens I found the following percentages:

Diam. of umbrella.	2–3 canals.	4 canals.	5–6 canals.	7–9 canals.	Total number of specimens.	Average number of canals.
2–5 mm.	2	84	8	7%	61	4·5
6–10 mm.	2	70	9	19%	106	4·8
11–15 mm.	3	46	5	46%	65	5·6
16–20 mm.	0	53	0	47%	19	5·7



Text-fig. 3.—*Phialucium carolinae*. Diagrams showing examples of arrangement of the radial canals. *a*, St. XXXIII, diam. 5 mm., the fifth canal short and blind. *b*, St. XXXV, diam. 5 mm., the fifth canal fully developed. *c*, St. XXXIX, diam. 3 mm. (4 lips). *d*, St. XXXIV, diam. 4 mm., the sixth canal very thin (stippled), but reaching out to the ring-canal. *e*, St. XXXIX, diam. 6 mm. (5 lips). *f*, St. XXXIX, diam. 9 mm. *g*, St. XXXXI, diam. 13 mm. *h*, St. XXXIX, diam. 7 mm. *i*, St. XXXIX, diam. 5 mm. (7 lips), two of the nine canals thin, but reaching out to the ring-canal.

The only specimen more than 20 mm. wide had 7 radial canals. These figures show that there is a marked increase in number of radial canals in proportion to the size of the individuals. The majority of the specimens keep the number of 4 throughout their life, but in several of them additional canals are developed during their growth. The final conclusion from this investigation is that specimens with supernumerary radial canals do not constitute a special variety in contrast to a typical four-rayed form, but that in certain geographical areas (as on the Great Barrier Reef and in the Philippine waters, c.f. Bigelow, 1919) this species exhibits considerable individual variation in the number of

radial canals, whereas in the numerous specimens observed by Mayer in Charleston Harbour the number was constantly four.

The radial canals and the ring-canal are very narrow. The gonads are linear, somewhat sinuous when mature, and, as a rule, they occupy the distal half of the radial canals, not quite reaching the ring-canal. According to the description by Mayer (1900) the gonads " are developed upon the radial tubes at about one-quarter the distance from the circular vessel to the proboscis," and in his figure of the whole medusa (pl. 3, fig. 9) they are shown as short and oval (as also occasionally seen in Australian specimens), but in his pl. 4, fig. 10, the gonads correspond exactly in shape and position with those of most of the Australian specimens.

The marginal organs are exactly as described and figured by Mayer (pl. 4, fig. 11). The tentacle-bulbs are large, globular or broadly conical, the tentacle being sharply demarcated from the bulb. The adaxial excretory papillae are usually very conspicuous, but by contraction they may sometimes be difficult to see ; they are present on all the tentacle bulbs and on the larger of the rudimentary bulbs (Text-fig. 2). The statocysts are very small.

The distribution of the marginal organs is more or less irregular, the spaces between fully developed tentacles varying in breadth. When the space is narrow, it contains only 1 rudimentary bulb ; when it is broad there are usually 3 rudimentary bulbs (rarely four) and 4 statocysts (rarely 5 or 6). If the number of rudiments between two tentacles is 3 the middle one is larger than the others, and is frequently seen in a progressive stage of development into a tentacle. As a matter of fact, the small marginal bulbs in this species are not " permanently rudimentary bulbs " as in *P. mbenga*, but every one of them has the potentiality of developing into a tentacle. New small marginal bulbs are, however, constantly added, so that even in the largest specimens there are always a number of rudiments between the tentacles. The rate of development is irregular, and there is no correlation between the size of the specimens and the relative number of tentacles and rudimentary bulbs.

Three specimens from St. XXXV, all with four radial canals, show the following arrangements of marginal organs :

Diam. 6 mm.

Perradial tentacles	I.	II.	III.	IV.	Total 4.
Other tentacles	2	2	2	2	8
Rudimentary bulbs	3 3 3	3 3 4	5* 3 3	3 3 3	39
Statocysts	6 4 4	4 4 6	7 3 4	4 4 4	54

Diam. 12 mm.

Perradial tentacles	I.	II.	III.	IV.	Total 4.
Other tentacles	5	5	4	3	17
Rudimentary bulbs	1 1 3 3 1 2	2 1 3 3 1 2	2 1 3 2 3*	3* 3 3 3	46
Statocysts	3 2 4 4 2 3	2 2 3 3 2 2	4 2 4 3 5	4 4 3 4	65

Diam. 15 mm.

Perradial tentacles	I.	II.	III.	IV.	Total 4.
Other tentacles	4	5	4	5	18
Rudimentary bulbs	3 2 3 3 4	2 2 3 3 3 2	1 2 1 3 4	4 1 3 2 1 1	53
Statocysts	4 6 4 3 5	4 4 4 4 3 3	3 4 3 5 5	6 3 3 3 1 2	82

* One especially large, developing into a tentacle.

The number of fully developed tentacles is independent of the number of radial canals. In specimens of different sizes I have counted the following number of tentacles :

Diam. (mm.).	Tentacles.	Diam. (mm.).	Tentacles.	Diam. (mm.).	Tentacles.
2	4–12	8	14–18	14	23–29
3	8–12	9	17–24	15	22–32
4	9–12	10	16–23	16	29
5	8–16	11	18–20	17	26
6	10–20	12	20–28	18	36
7	18–23	13	28	19	28–36

The Australian specimens thus seem to have a somewhat larger number of tentacles than the Atlantic-American specimens. Though the species was " extremely abundant " in Charleston Harbour, Mayer described only one specimen, which was 14 mm. wide with 16 tentacles ; presumably the numerous specimens in this locality were subject to some variation, of which, however, no information is given.

Occurrence in the Great Barrier Reef area.—Phialucium carolinae was never taken in the hauls over deep water outside the reefs, whereas it was very common in the shallow-water areas. It occurred almost throughout the period of investigation, but in varying number, as will be seen from Table II, in which are also given the size-limits of the specimens in each month.

TABLE II.—*Seasonal Occurrence of* Phialucium carolinae.

Month.	VII.	VIII.	IX.	X.	XI.	XII.	I.	II.	III.	IV.	V.	VI.	VII.
Estimated average number of specimens per one haul	0·2	0·1	0	7	8	65	60	2	16	87	2	1	0
Diameter of umbrella (mm.)	9	14	–	4–6	3–19*	3–19	2–18	5–19	2–19	3–16	3–12	5	–

* Also one 26 mm.

The species was particularly abundant from the middle of November to the end of January, and again from the end of March to the middle of April. The scarcity in February and the greater part of March may be due to hydrographical conditions. The medusa was rare during the winter, but apparently, as seen from the last column in the table above, it has no definite breeding season, young as well as adult specimens occurring at any time.

Distribution.—This species was originally described from Charleston Harbour, South Carolina, on the southern part of the east coast of North America (Mayer, 1900) and later recorded from the Tortugas, Florida (Mayer, 1910). It is most probably the same species which has been recorded under different names from Ceylon (Browne, 1905), Madras in India (Menon, 1932), the Malayan Archipelago (Maas, 1905 ; Vanhöffen, 1911 ; Stiasny, 1928), the Philippine Islands (Bigelow, 1919), Amoy in China (Vanhöffen, 1912*b*) and the Pelew Isles (Uchida, 1947).

Phialucium condensum n. sp.

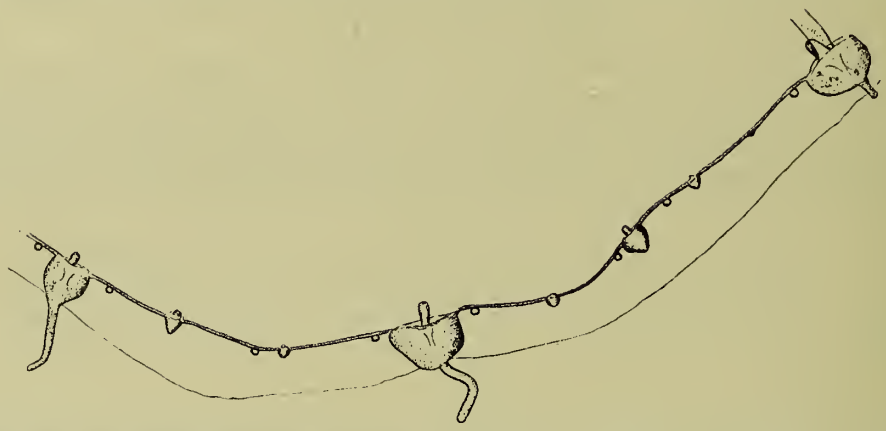
(Pl. I, fig. 4.)

Material.—

St. LI, S. 25.iii.29. 1 specimen ; 5 mm. wide.
St. LIV, S. 20.iv.29. 1 specimen ; 5 mm. wide.

St. LIX, S. 31.v.29. 1 specimen; 6 mm. wide.
„ C. 31.v.29. 1 specimen; 6 mm. wide.
St. LXI, S. 14.vi.29. 1 specimen; 7 mm. wide.

Description.—Umbrella almost as high as wide, with dome-shaped apex, jelly very thick, tapering in thickness towards the margin. Stomach quadrate, broad and flat, attached to the subumbrella along the sides of a perradial cross. Mouth tube short; mouth with 4 short simple lips. Four radial canals and ring-canal very narrow. Gonads about one-fourth to one-third as long as the radial canals, situated very near the corners of the stomach. About 12 marginal tentacles, placed at somewhat irregular distances from each other, with globular or broadly conical bulbs, each provided with a well-developed adaxial excretory papilla (Text-fig. 4). Between each successive pair of tentacles there are 1, 2 or 3 small rudimentary bulbs; when there are 3 the median one is larger than the others; the rudimentary bulbs have excretory papillae, except when very small. The



Text-fig. 4.—*Phialucium condensum*, n. sp., St. LIX. Margin of umbrella. × 35.

statocysts are very small, alternating with tentacles and rudimentary bulbs; when the number of bulbs between two tentacles is 3 there are 4 statocysts. Velum fairly narrow.

It is with some hesitation that I describe these specimens as belonging to a new species. They differ from *P. carolinae* only in the position of the gonads, which are placed at a very short distance from the corners of the stomach. This might be considered a juvenile state, but in one of the specimens, 6 mm. wide, the gonads contain well-developed eggs, and specimens of *P. carolinae* of the same size have not the slightest trace of gonads, and when the gonads appear, their position is in the distal parts of the radial canals.

One of the specimens, 6 mm. wide, is abnormal; it has only 3 radial canals, but 14 tentacles. All the other specimens have 12 tentacles.

This species was only taken in March and April, and only 5 specimens were found.

The specimen from St. LIV is chosen as the type and figured in Pl. I, fig. 4.

Genus *Eirene* Eschscholtz.

I provisionally retain this genus with the 12 species which have been referred to it (see Kramp, 1936), but it is possible that in future we must subdivide it. Some of the species are evidently closely related to species of *Phialucium* and *Octocanna*, from which they only differ in the possession of a gelatinous stomachal peduncle of very variable

size and shape ; excretory pores are present in some species, lacking in others ; in some species additional tentacles soon attain the same size as the previous ones, so that in any stage of development the majority of the tentacles are of the same shape and size, in other species the development of new tentacles is retarded, and one or more tiny rudimentary bulbs are always present in each of the spaces between two fully developed tentacles, exactly as in *Phialucium carolinae* as described above. *E. hexanemalis* has been separated from the other species on account of its number of radial canals normally being six, but the newly liberated medusae have only 4 radial canals, and in adult specimens the number varies from 4 to 8 (see below). The whole question of the taxonomy of these medusae and their relatives is very complicated. and until further investigations have been carried out, it seems the safer course to regard species with a stomachal peduncle, with gonads restricted to the subumbrellar parts of the radial canals, with a large and undetermined number of statocysts, and without cirri, as belonging to the genus *Eirene*. Five species of *Eirene* are represented in the collection from the Great Barrier Reef Expedition.

Text-fig. 5.—*Eirene hexanemalis*. Margin of umbrella. × 35.

Eirene hexanemalis (Goette).

Irenopsis hexanemalis Goette, 1886, Sitz. ber. Akad. Wiss. Berlin, p. 832 ; Mayer, 1910, p. 310, text-figs. 171, 171*a*.

For further synonomy, see Kramp, 1936, p. 248.

Material.—255 specimens were preserved ; they were taken within the period from 3rd October, 1928, to 14th June, 1929 (see Table XVIII and the discussion below).

Remarks on the Morphology and Variation.—This species has been described and figured by several authors, and I shall add only some few remarks. The stomachal peduncle is always distinct, though in several cases it is very low and broad. The base of the stomach is narrow, more or less star-shaped. The mouth-lips are pointed and crenulated. The gonads are linear, comparatively short and placed in the distal portions of the radial canals, terminating at a short distance from the ring-canal ; they surround the radial canals completely and are not longitudinally divided along the subumbrellar edge. The number of radial canals is usually 6, but the distance between them is frequently somewhat irregular, and there is not always a tentacle exactly opposite every canal. The adaxial excretory papillae on the tentacle bulbs are distinct. In each inter-tentacular space (Text-fig. 5) there is at least 1 and usually 3 very small rudimentary marginal bulbs, the median one somewhat larger than the others, sometimes so large that it must be designated as a young tentacle. Between two successive tentacles there are usually 4, but sometimes 2 or 6 small statocysts ; the number depends on the distance between the tentacles, which is rather variable. The shape and arrangement of the marginal organs bear a very close resemblance to the conditions in *Phialucium carolinae*.

The gonads make their first appearance as tiny dots, when the medusa is 4–5 mm in diameter (see Table III) ; the greatest length observed was 7 mm. in a specimen 19 mm. wide ; even in adult specimens the length of the gonads is very variable.

TABLE III.—*Variation in* Eirene hexanemalis.

Diam of umbrella (mm.).	Number of radial canals. 4.	5.	6.	7.	8.	Number of specimens examined.	Length of gonads (mm.). Limits.	Average.	Number of tentacles.
2	–	1	1	–	–	2	none	–	6
3	–	–	2	–	–	2	,,	–	10–12
4	1	1	4	1	–	7	dots	–	12–16
5	–	1	10	–	–	11	,,	–	12–15
6	–	3	13	3	–	19	dots to 0·5	–	12–22
7	–	2	11	4	–	17	0·5	0·5	18–29
8	–	–	21	–	–	21	1	1	19–31
9	–	–	14	–	–	14	1–2	1·3	20–29
10	–	3	12	1	–	16	2–3	2·25	23–38
11	–	2	15	3	–	20	1–4	2·6	24–40
12	–	–	23	3	–	26	2–5	3·3	23–46
13	–	1	17	2	–	20	2–6	3·75	25–47
14	–	1	15	1	–	17	3–6	4·7	34–48
15	–	1	5	–	–	6	3–5	4·3	30–46
16	–	–	10	–	–	10	4–6	5·3	38–51
17	–	–	5	–	1	6	3	(3)	43
18	–	–	2	–	–	2	6	(6)	–
19	1	–	6	–	–	7	4–7	(5·5)	34–48
20	–	–	–	–	–	0	–	–	–
21	–	–	–	–	–	0	–	–	–
22	–	–	–	1	–	1	6	(6)	49
Totals	2	16	186	19	1	224			
%	0·9	7·1	83·0	8·5	0·4				
Average diam. (mm.)	(11·5)	8·6	11·5	10·5	(17)				

The variation in number of radial canals is seen in Table III, from which it appears that the normal number of 6 is found in the vast majority of the specimens, 83%, and the variants are grouped very regularly towards both sides, in contrast to the variation in *Phialucium carolinae*, where the curve of variation has two summits. Within the size-limits represented in this collection there is no correlation between the number of radial canals and the size of the specimens, but in specimens less than 2 mm. wide the number is always four.*

The number of fully developed tentacles in specimens of different sizes is seen in Table III, from which it immediately appears that specimens of equal size may have a very variable number of tentacles; the greatest number observed was 51 in a specimen 16 mm. wide.

TABLE IV.—*Seasonal Occurrence of* Eirene hexanemalis.

Month.	VII.	VIII.	IX.	X.	XI.	XII.	I.	II.	III.	IV.	V.	VI.	VII.
Estimated average numbers of specimens per one haul	0	0	0	1	12	78	112	17	50	7	1	1	0
Diameter of umbrella (mm.)	–	–	–	4–17	4–18	6–22	4–17	2–15	2–19	7–14	8	7–8	–
Average diam. (mm.)	–	–	–	8·2	10·2	12·1	10·2	8·1	8·6	10·6	(8)	(7·5)	–

* On the Danish "Galathea" expedition, 1951, I found a complete developmental series of specimens 1–16 mm. wide on the coast of Mindanao in the Philippines.

Seasonal Occurrence (see Table IV).—*E. hexanemalis* was very seldom taken over deep water outside the reefs. It was completely lacking in July, August and September, and very few were found in October and in May and June, whereas it was very common during the summer from November to March (though less abundant in February), with a distinct maximum of occurrence in December to January. The occurrence of this medusa thus seems to be restricted to a definite season of the year. Nevertheless young as well as adult specimens were taken at any time within this period. Among the 6 specimens found in October, 5 were young ones 4–7 mm. wide, but there was also one adult, 17 mm., and during the following months specimens of all sizes were taken. Thus the liberation of medusae from the (unknown) hydroid of this species evidently takes place throughout the year, but is more active in one part of the year than during the remainder, corresponding to the second of the four "types of breeding" in tropical bottom animals as set forth by A. Stephenson (1934, p. 270).

Distribtuion.—Eirene hexanemalis is widely distributed in the Indian Ocean and western Pacific; it has been recorded from Zanzibar, Ceylon, Madras, Nicobar Islands, Singapore, numerous localities in the Malayan Archipelago, Hong Kong, and southern Japan. It is recorded here from Australia for the first time.

Eirene palkensis Browne.

Irene palkensis Browne, 1905, Ceylon Pearl Oyster Fish., Supp. Rep. **27**, p. 141, pl. 3, figs. 12–16.
Phortis palkensis, Mayer, 1910, p. 309.

Further synonomy, see Kramp, 1936, p. 250.

Material.—

St. XXXVI, S. 4.i.1929. 1 specimen.

This is another of the species of *Eirene*, in which 1–3 rudimentary bulbs are present in each space between two successive tentacles. I have seen the type-specimen in the British Museum and can state that it is a valid species. It differs from 4-rayed specimens of *E. hexanemalis* by the slender shape of its stomachal peduncle and much longer gonads. Only one specimen was taken on the Great Barrier Reef; it was 17 mm. in diameter, the peduncle very slender, $\frac{3}{4}$ length of bell-radius; gonads narrow, linear, extending from the base of the peduncle almost to the ring-canal. Forty fully-developed tentacles; intertentacular spaces with 1–3 rudimentary bulbs, the median one somewhat larger than the others, and 2–4 statocysts. An excretory papilla is visible on some of the tentacle-bulbs, but in most of them it cannot be seen, exactly as in the type-specimen. As Browne rightly points out, this may be due to contraction.

Distribution.—This species was first described from Ceylon. According to Vanhöffen (1911, 1912*a*, 1912*b*) it has also been found at the Nicobar Islands, near Amoy and Hong Kong, and at Port Natal in East Africa. It has not previously been recorded from Australia.

Eirene kambara Agassiz & Mayer.

(Pl. II, fig. 5.)

Eirene kambara Agassiz & Mayer, 1899, Bull. Mus. comp. Zool. Harvard, **32**, p. 169, pl. 8, fig. 29; Bigelow, 1909, p. 161; Kramp, 1936, p. 248.
Phortis kambara. Mayer, 1910, p. 309; Bigelow, 1919, p. 303.

Material.—

St. XVIII, C. 15.x.1928. 3 miles E. 2 specimens ; diam. 4 mm.
St. XXV, S. 16.xi.1928. 3 miles E. 2 specimens ; diam. 5–7 mm.
St. XLIII, S. 26.ii.1929. C.B. 2 specimens ; diam. 3–7 mm.
St. XLV, S. 28.ii.1929. O.C.P. 1 specimen ; diam. 5 mm.
St. XLVIII, S. 15.iii.1929 3 miles E. 1 specimen ; diam. 4 mm.
St. XLIX, C. 17.iii.1929. I.P.P. 1 specimen ; diam. 5 mm.

The only description of this species was based on a single specimen taken at the Fiji Isles. Bigelow was inclined to regard it as a young specimen of *E. ceylonensis*, partly because it was supposed to be destitute of gonads. It is true that gonads are not indicated in the figure of the medusa, but in the description it is stated that the gonads occupy the lower portions of the radial canals. The present specimens, however, differ distinctly from specimens of *E. ceylonensis* of similar size, as I have seen them in the collection from the Great Barrier Reef. In specimens of this latter species, 3·5–8 mm. wide, the peduncle is very slender, $\frac{1}{2}$–$\frac{2}{3}$ of bell radius length, and the mouth-lips are long and pointed with frilled margin ; moreover the gonads are elongated, and the number of the tentacles is considerably larger. Even in such young specimens of *E. ceylonensis* there are no, or very few, rudimentary marginal bulbs between the tentacles.

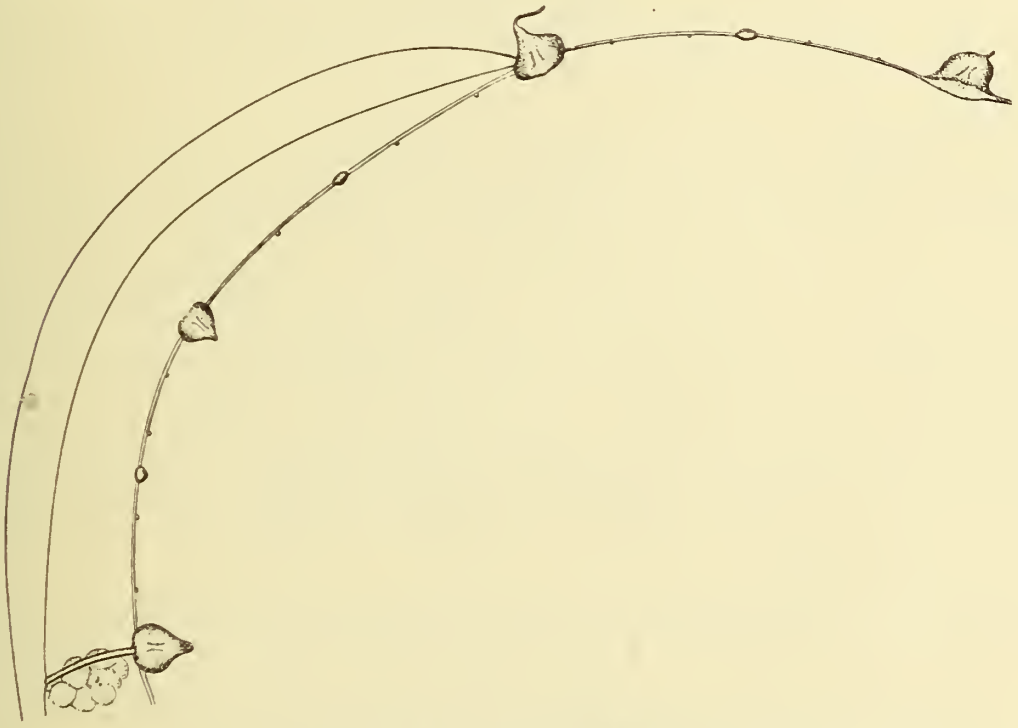
Remarks on the Specimens.—The young specimens from St. XVIII, 4 mm. wide, have 8 tentacles, 8 young marginal bulbs and some few very tiny ones ; the gonads are just visible as tiny swellings near the ring-canal. In the specimens 5–7 mm. in diameter the jelly of the exumbrella is very thick, evenly rounded, the peduncle short and very broad, distinctly marked off from the concave peripheral portion of the subumbrella, with a tendency to form 4 interradial protuberances near the stomach ; this is evidently a result of contraction. The stomach is narrow and elongated, cross-shaped in transverse section ; the mouth has 4 short and simple lips. The gonads are short and oval, placed near the ring-canal; in one specimen (St. XLIII, 7 mm. wide, Plate II, fig. 5) 2 of the 4 gonads contain large, ripe eggs. The radial canals and ring-canal are very narrow. These specimens have 15–19 tentacles with broad basal bulbs (Text-fig. 6) ; excretory pores are not visible, and are apparently lacking. Between every successive pair of tentacles there is one small rudimentary bulb and usually four remarkably small statocysts ; the total number of statocysts in all specimens 5–7 mm. wide is about 64. The velum is fairly narrow.

These specimens seem to me to differ from the type-specimen of *E. kambara* in one point only, *viz.*, the number of fully developed tentacles. The type was slightly larger, 8 mm. in diameter, with 32 small tentacles and no rudimentary bulbs ; if the rudimentary bulbs of the Australian specimens develope into tentacles, their number will likewise be about 32, and the number of statocysts is the same as in the type. I do not hesitate, therefore, to refer these Australian specimens to a species originally described from the Fiji Isles, and after seeing the present specimens I am sure that *E. kambara* is a distinct species which cannot be confounded with any other species of *Eirene*.

The specimen from St. XLVIII, 4 mm. wide, is abnormal ; it has 12 tentacles and 12 rudimentary bulbs and 2 stomachs. There is a central stomach of normal shape, but in the middle portion of one of the four radial canals a second and somewhat smaller stomach is developed ; it has the same elongated shape as the normal one, but the mouth has only

2 lips ; from one side of the base of this secondary stomach a canal issues perpendicularly, making a bend outwards and approaching the ring-canal, which, however, is not reached. This abnormality recalls the conditions in the different species of *Gastroblasta*, all of which are most certainly abnormal specimens of *Phialidium* or similar medusae, or specimens in the act of asexual reproduction by fission.

Distribution.—Previously known only from the Fiji Isles.



TEXT-FIG. 6.—*Eirene kambara*, St. XLIII. Margin of umbrella. × 35.

Eirene ceylonensis Browne.

Irene ceylonensis Browne, 1905, Ceylon Pearl Oyster Fish., Supp. Rep. **27**, , p. 140, pl. 3, figs. 9–11.
Phortis ceylonensis, Mayer, 1910, p. 309.

For further synonomy, see Kramp, 1936, p. 249.

Material.—

St. XXV, C. 16.xi.28. 3 miles E. 3 specimens ; diam 8, 18, 22 mm.
St. XXXVI, S. 4.i.29. 3 miles E. 2 specimens ; fragmentary.
St. LI, S. 25.iii.29. 3 miles E. 1 specimen ; diam. 3·5 mm.

Of this well-known and well-described species only some few individuals were taken on the Great Barrier Reef. I have counted the following numbers of tentacles :

Diam. of umbrella (mm.)	3·5	8	18	22
Number of fully developed tentacles	32	42	*c.* 70	*c.* 84

Young bulbs may sometimes be present among the fully developed tentacles ; in the specimen 8 mm. wide there are 12, in the largest specimen (22 mm.) even as many as about 50 (they could only be counted in half the circumference). The smallest specimen, 3·5 mm. wide, has no rudiments between the 32 tentacles. In the largest specimen the

gonads occupy the entire length of the radial canals from the base of the peduncle to the ring-canal; they are very thin and seem to have shed their contents of sexual products.

Distribution.—Ceylon, brackish water in the Ganges estuary, Java Sea, and the Philippine Islands. Not previously recorded from Australia.

Eirene menoni n. sp.

(Plate II, fig 6.)

Phortis sp. Menon, 1932, p. 18.
Phortis lactea Mayer, Ling, 1937, p. 357, figs. 9–10.

Material.—

St. XXXII, S. 5.xii.28. 3 mi. E. 1 specimen.

Description (Plate II, fig. 6).—Umbrella 12 mm. wide and 5 mm. high, evenly rounded; jelly fairly thin, tapering towards the margin; stomachal peduncle slender, slightly widened at the base, its length somewhat less than the height of the subumbrellar cavity. Stomach short; mouth with four well-developed, pointed lips with frilled margins. Four radial canals and ring-canal narrow, gonads linear and somewhat sinuous, extending from the base of the peduncle almost to the ring-canal. Forty-six tentacles with conical bulbs and two young marginal bulbs. No excretory papillae. The tentacles are all of nearly the same size, but the distance between them is variable. The number of statocysts between two successive tentacles is 1–3, dependent on the distance between the tentacles. Velum moderately broad. In formalin the stomach, gonads and tentacle-bulbs are reddish brown.

This medusa evidently belongs to the same species as that described by Ling (1937) from the Chekiang Coast, China. He referred it to *Phortis lactea* Mayer, a small medusa found at the Tortugas, Florida. In that species, however, the peduncle is considerably longer, extending well beyond the subumbrella cavity and broader at its base; the lips are short and simple, and the gonads, which were ripe, did not quite reach either the ring-canal or the base of the peduncle. It therefore seems to me rather improbable that the Chinese and Australian medusae belong to this western Atlantic species. On the other hand, it seems to me very probable that the medusae described (but unfortunately not figured) by Menon from the coast of India near Madras are identical with the Chinese and Australian forms. Menon's medusae were up to 7 mm. wide with about 48 tentacles; the Chinese form has about 32 tentacles when 8 mm. wide; the single Australian specimen is 12 mm. wide with 48 tentacles (including two young bulbs). I name this species in honour of Mr. Menon, who gave the first description of it.

Distribution.—Coral Sea; China Sea; Bay of Bengal.

Helgicirrha malayensis (Stiasny).

Eirene malayensis Stiasny, 1928, Zool. Meded. Mus. Nat. Hist. Leiden, **14**, 4, p. 210, text-fig. 1; Menon, 1932, p. 20, pl. 3, fig. 23.
Helgicirrha malayensis, Kramp, 1936, p. 255.
Eirene madrasensis Menon, 1932, p. 20, pl. 3, fig. 24.

Material.—234 specimens were preserved; they were taken during the period from 20th September, 1928, to 14th June, 1929. See Table XVIII and the discussion below.

Since I have seen these numerous specimens, which evidently belong to *H. malayensis* Stiasny, I now doubt very much the supposed identity of this species with *H. danduensis*

(Bigelow, 1904 ; see Kramp, 1936, pp. 255–256). The single specimen of *H. danduensis*, taken at the Maldive Islands, might perhaps be considered as an aberrant individual with an especially elongated stomach and comparatively short gonads ; but not one of the Australian specimens showed these features ; in all of them the stomach is short, and the gonads, except in the very young specimens, always reach from the ring-canal at least to the base of the peduncle and frequently somewhat down the sides of the peduncle. I prefer, therefore, to regard *H. malayensis* as a distinct species. The medusae from India, described by Menon, undoubtedly belong to the same species.

The specimens from the Great Barrier Reef differ from the Malayan and Indian specimens only in one respect, *viz.*, the number of tentacles. According to Stiasny specimens 20 mm. wide have up to 45 tentacles, and Menon counted about 50 tentacles in specimens 25 mm. in diameter. In the specimens examined by me I found the following number of tentacles, some of which were quite small but with distinctly pointed tips :

Diameter of umbrella (mm.)	3– 5	6–10	11–15	16– 20	21– 25
Number of tentacles	16–34	30–60	48–91	90–141	114–141

The relative number of tentacles and rudimentary bulbs (all of which have the potentiality of developing into tentacles) is very variable and independent of the size of the individuals. There is frequently an equal number of both, or twice (rarely 3 times) as many young bulbs as tentacles, but sometimes there are two or three or even four times as many tentacles as young bulbs. In two specimens (St. XVIII), 17 mm. wide, there are about 120 tentacles of different sizes and only some few young bulbs. These specimens lead me to the conclusion that the medusae from Madras described by Menon as a new species, *H. madrasensis*, are similar specimens of *H. malayensis*, in which most of the marginal bulbs have developed into tentacles.

The cirri are readily lost in the preserved specimens, but in a few specimens I have found almost all of them retained, and they were present on the tentacle bulbs as well as on the largest of the young bulbs.

The number of statocysts is somewhat variable ; as a rule they are present in about the same number as tentacles + young bulbs, but in some of the larger specimens the number of statocysts does not exceed the number of tentacles.

The succession of the marginal organs on the umbrella margin is somewhat irregular. In a specimen 23 mm. wide I have found the following succession (*t* = tentacles of all sizes, *b* = young bulbs, *s* = statocysts) : *bstbsttbstsbtbstsbstsbtsttsttbsttbststbstbtbstbstbstbststt*, altogether 23 tentacles (large and small ones), 15 young bulbs, and 19 statocysts.

Adaxial excretory papillae may be difficult to see, but sometimes they are quite distinct.

Two small specimens, 5 and 7 mm. wide (St. XXVII) had swallowed one or two appendicularians, tail first, the bodies hanging outside the mouth of the medusae ; another specimen in the same catch had swallowed a *Sagitta*, head first.

TABLE V.—*Seasonal Occurrence of* Helgicirrha malayensis.

Month.	VII.	VIII.	IX.	X.	XI.	XII.	.	I.	II.	III.	IV.	V.	VI.	VII.
Estimated average number of specimens per one haul	0	0	0·2	7	7	39	.	17	32	15	6	7	1	0
Diam. of umbrella (mm.).	–	–	6–10	8–17	4–20	11–25	.	4–28	5–24	6–20	10–22	6–24	9	–

Seasonal Occurrence (see Table V).—*Helgicirrha malayensis* was entirely lacking in the samples from July and August, and it was scarce until the middle of November; it then increased rapidly in numbers with maximal occurence in December to February and thenceforward occurred in variable quantities until May; one single specimen was taken as late as 14th June, and after that date the species disappeared completely. Within the period of common occurrence, October to May, young as well as adult specimens were found at any time, so that medusae are presumably liberated from the unknown hydroid throughout the year, though with a considerably greater activity during the summer and autumn.

Distribution.—Java Sea and east coast of India.

Eutima levuka (Agassiz & Mayer).

Eutimeta levuka Agassiz & Mayer, 1899, Bull. Mus. comp. Zool. Harvard, **32**, p. 163, pl. 9, figs. 30, 31.
Eutima levuka var. *ocellata* Maas, 1905, p. 35, pl. 7, figs. 43, 44.
Eutima lactea Bigelow, 1904, p. 253, pl. 2, figs. 7, 8; Mayer 1910 p. 300, text-fig. 164.
Eutima levuka, Mayer, 1910, p. 301; Bigelow, 1919, p. 299; Stiasny, 1928, p. 208.
Eutimeta levuca, Apstein, 1913, p. 611.
non *Eutima levuka*, Bigelow, 1909, p. 165, pl. 5, figs. 2, 3, pl. 35, figs. 1, 2.

Material.—The preserved collection contains 54 specimens which were taken during the period 11th September, 1928, to 25th May, 1929 (see Table XVIII), usually in very small numbers. The specimens varied from 4·5 to 14 mm. in diameter, apparently without correlation to the season.

I agree with Bigelow (1919) that *E. lactea* from the Maldive Islands is the same species. On the other hand, I do not think that the specimens from the west coast of Mexico, described by Bigelow (1909), belong to this species. The specimens were 6 mm. in diameter with no trace of interradial tentacles. In the present collection there are two small specimens only 4·5 mm. wide; one of them has eight well-developed tentacles, and in the other the interradial tentacles are represented by large bulbs. Bigelow (1919, p. 301) describes another medusa from the Philippines and refers it with a query to *E. levuka*; it was 11 mm. wide and had 23 large tentacles. It seems to me impossible that this species should ever be able to develop such a large number of tentacles; none of the specimens from the Great Barrier Reef have more than eight tentacles, though some of them are 12–14 mm. wide.

Two of the present specimens are somewhat abnormal. In one of then (9 mm. wide) one of the radial canals is bifurcated; in the other (8 mm. wide) one of the quadrants is narrower than the others and has no interradial tentacle, whereas in the opposite quadrant there are 2 tentacles close together in the interradius.

Distribution.—*Eutima levuka* occurs in the Malayan Archipelago and at the Maldive Islands, the Philippines and the Fiji Isles. Not previously recorded from Australia.

Eutima curva Browne.

Eutima curva Browne, 1905, Ceylon Pearl Oyster Fish., Supp. Rep. **27**, p. 138, pl. 3, figs. 1–3; Mayer, 1910, p. 300.
Eutima australis Mayer, 1915, p. 201, pl. 3, fig. 5.

Material.—Several specimens were taken between 6th September, 1928, and 7th June, 1929 (see Table XVIII). The occurrence was fairly evenly scattered over this period. The size of the specimens varied from 6 to 11 mm. in diameter without any relation to the season.

Distribution.—The only previous record of this species is from Ceylon, but the medusa from Torres Strait, described by Mayer (1915) as a new species, *Eutima australis*, seems to be the same species. It has a similar hook-like abaxial process on the four tentacle bulbs and a patch of black pigment in the tips of the marginal warts. It is said to have eight gonads, but they "appear to reach maturity only over the peduncle." The presumed subumbrellar gonads may, therefore, be only slight dilatations of the walls of the radial canals, and if so the species is in almost perfect agreement with *E. curva*.

Genus *Aequorea* Péron & Lesueur.

It has repeatedly been emphasized that the numerous species of *Aequorea* need a revision. The collection of the Great Barrier Reef Expedition is of considerable interest in this respect. It contains the following four species *A. conica* Browne, *australis* Uchida, *pensilis* Haeckel, and *macrodactyla* Brandt, all of them represented by juvenile as well as adult specimens, and they give occasion to a discussion of the limitation and affinities of these and related species.

In the literature *A. conica* is mainly characterized by the peculiar shape of the umbrella, which is provided with a highly vaulted and very thick apical mass of jelly; very young individuals of the other species may, however, have a similar shape. Nevertheless *A. conica* is well distinguished by other features and should be considered a valid species.

A. australis was described as a new species as late as 1947; it resembles *A. globosa* Eschscholtz, but the numerous specimens in the present collection have convinced me of its validity as a distinct species.

A. pensilis and *macrodactyla* are old and well-known species observed and described by several authors. Russell (1939) is inclined to regard the latter as a variety of *pensilis*; his conclusion is based on the careful examination of specimens from British waters. In the present collection, however, the two forms seem to be so distinctly separable that I must regard them as two independent species. Specimens less than 7–8 mm. in diameter have not previously been described; in the samples from the Great Barrier Reef both species are represented by very young stages only 2 mm. wide.

Aequorea conica Browne.

Aequorea conica Browne, 1905, Ceylon Pearl Oyster Fish., Supp. Rep. **27**, p. 145, pl. 1, fig. 2, pl. 2, figs. 16, 17, 18; Stiasny, 1928, p. 213.

Material.—

St. XLI, C. 13.ii.29. 3 miles E. 1 specimen; diam. 2·2 mm.
St. XLIV, S. 27.ii.29. Li.I. 2 specimens; diam. 5 and 6 mm.

Description of the Specimens.—Diam. 2·2 mm., as high as wide, with a very thick and vaulted apical projection; stomach 1 mm. wide. Fifteen radial canals, seven of which carry a well-developed, swollen gonad occupying a little less than the proximal half portion of the radial canal; in the remaining eight canals the gonads are only slightly indicated. The mouth-lips opposite the seven canals with well-developed gonads are long and pointed, considerably longer than the other ones. The umbrella margin is somewhat damaged, and the number of tentacles could not be determined.

Diam. 5 mm., height 3 mm., of which the apical jelly makes about one-half. Stomach 2 mm. wide. Sixteen radial canals, two of them without gonads; on the other canals the gonads are well developed, more or less swollen, along a little less than the proximal half of the canals. Sixteen mouth-lips, all of them long and pointed; 12 fully developed tentacles and some young bulbs.

Diam. 6 mm., height 4 mm., apical jelly 2 mm. Stomach 2·5 mm. wide. Sixteen radial canals, all alike, with well-developed gonads along the entire half portion of the canals nearest to the stomach; the gonads are linear and only moderately swollen. Sixteen long and pointed mouth-lips; 27 tentacles. In about half the number of intertentacular spaces there is a minute rudimentary bulb and usually two statocysts; in the spaces without a rudimentary bulb there is only one statocyst.

The tentacle bulbs are pear-shaped or almost globular, with no indication of abaxial spur or adaxial excretory papilla. In comparison with specimens of similar size of other species the long and pointed mouth-lips are very remarkable.

This little medusa, remarkably small for an *Aequora*, was described from the Gulf of Manaar between Ceylon and the south coast of India. Browne saw six specimens, 5–7 mm. in width and 6–8 mm. in height with 15–18 radial canals (usually 16) and about 26–30 tentacles. Between two successive tentacles there was a very minute marginal bulb and two statocysts, sometimes only one. In spite of their small size the specimens all had ripe gonads, confined to the proximal half of the radial canals. Also in these specimens the oral lips are stated to be long and slender. The agreement between the present specimens and the types is so perfect in all essential features that I refer them without any doubt to the same species.

Stiasny examined a considerable number of specimens of this species collected in the Java Sea and near Singapore, some of them somewhat larger than the types, being up to 9 mm. in diameter and 10–12 mm. in height, and with somewhat longer gonads; the number of radial canals varied between 14 and 20, but was usually 17 or 18.

There is only one other species of *Aequorea* which has ripe gonads at a similar small umbrellar-diameter, *viz.*, *A. parva* Browne (1905). The original specimens from Ceylon were only up to 6 mm. wide, but somewhat larger specimens have been observed from Djibouti in the Gulf of Aden (Hartlaub, 1909), Java Sea and Singapore (Stiasny, 1928) and Madras (Menon, 1932). This species differs from *A. conica* in that the numbers of tentacles never exceed eight (usually only four), in the position of the gonads in the middle portion of the radial canals, and in having a much larger number of rudimentary marginal bulbs and statocysts. The two species are quite distinct.

Aequorea australis Uchida.

Aequorea australis Uchida, 1947, Journ. Fac. Sci. Univ. Hokkaido (4) Zool. **9**, p. 307, text-fig. 8.

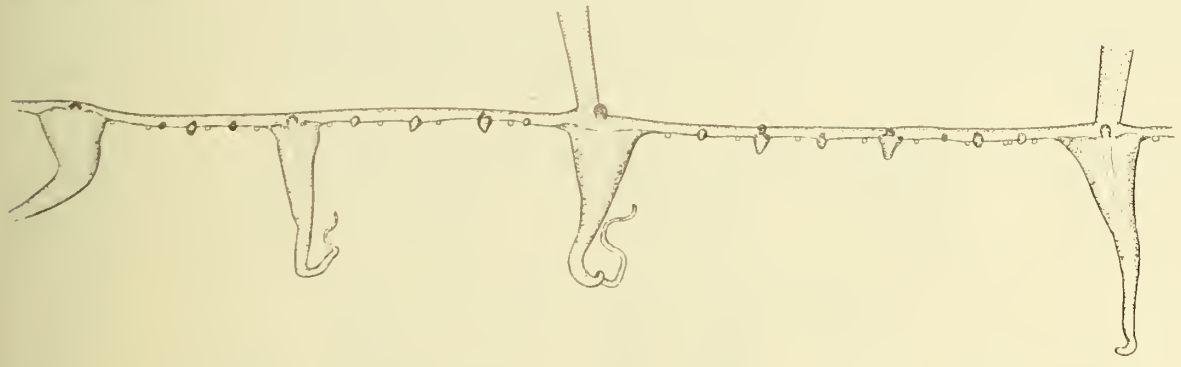
Material.—157 specimens of this medusa were preserved by the Great Barrier Reef Expedition. It occurred in varying numbers throughout the whole duration of the expedition, with only short interruptions (see Table XVIII and the discussion below).

The original specimens were taken on the coast of Arnhem Land, Northern Australia, and at the western part of New Guinea. The specimens from the Great Barrier Reef agree perfectly with the original description, but many of them are of smaller or larger size, ranging from 2 mm. to 38 mm. in diameter, whereas the type-specimens only varied between

11 and 31 mm. The question must, however, be considered whether it is a valid species distinct from *A. globosa* Eschscholtz.

Remarks on the Morphology.—Among the Australian species of *Aequorea* this species is immediately conspicuous by the comparatively small size of the stomach, the distal position of the gonads, and the approximately equal number of tentacles and radial canals. The umbrella is rather flat, the gelatinous substance moderately thick, thinner towards the margin, which is generally bent inwards in preserved specimens. In very young specimens the umbrella is sometimes, but not always, highly vaulted and provided with a thick, dome-shaped apical projection. I have measured almost all the specimens and counted their radial canals and tentacles, except in some few which were badly preserved. The diameter of the umbrella was measured in the actual condition of the specimens regardless of the margin being more or less bent inward; this evidently causes a certain degree of inexactitude in the calculations of the relative dimensions and numbers given in Table VI.

The stomach is flat and the mouth usually widely open, but in some specimens the mouth is narrowed, and then the stomach attains a funnel-shaped appearance. The lips are fairly short.



TEXT-FIG. 7.—*Aequorea australis*, St. XXXII. Margin of umbrella. × 25.

The counts of the radial canals include all the canals reaching from the stomach to the ring canal, even if some of them are quite narrow, recently developed and still destitute of gonads. As a rule the development of additional canals seems to proceed irregularly, but in some few specimens new and thin canals alternate almost regularly with the fully differentiated ones: this has been observed in specimens of the following sizes: 5, 9, 14 and 16 mm. in diameter. Short, blindly ending canals are occasionally seen; they are not included in the counts. Anastomoses and other irregularities of the radial canals may occur, but not very frequently.

Gonads may begin to appear, when the diameter of the umbrella is only 8 or 9 mm., but even in specimens about 17 mm. wide the gonads may still be very slightly developed. In adult specimens the gonads are linear, slightly wavy, about half as long as the radial canals and placed considerably nearer to the ring canal than to the stomach, being separated from the ring canal by a very short space, but widely apart from the stomach.

The tentacle bulbs (Text-fig. 7) are remarkably slender and have no indication of an abaxial spur. Between the tentacles there are a varying number of minute marginal bulbs, slightly conical or tenon-like; some of them are usually a little larger than the others and are in reality developing into tentacles. The largest of these young bulbs as well as

the tentacle bulbs are each provided with a distinct adaxial excretory papilla (this is not mentioned in the description by Uchida). In some few of the specimens the tentacles are well extended and almost as long as the diameter of the umbrella. The distance between the tentacles is more or less irregular, and not all of them are placed opposite the end of a radial canal. According to the distance between two successive tentacles the number of young marginal bulbs may vary from 3 to 12 ; in a specimen 17 mm. wide with 19 tentacles I counted 105 tiny bulbs. As a rule the statocysts are present in the same number as the tentacles + rudimentary bulbs, one between each successive pair, regardless of the size of the bulbs.

The relative size of the stomach is seen from Table VI. The variation is rather considerable, but on an average the diameter of the stomach is a little more than one-third the bell-diameter, and it never attains half the width of the umbrella. The rate of development of the radial canals and tentacles is somewhat irregular (see Table VI). In the youngest stage observed, 2 mm. wide, there were eight radial canals, but I have also seen specimens 3–5 mm. wide with only eight canals; on the other hand, a small individual, 2·5 mm wide, already had 16 canals, and the same number was found in some fairly large specimens, 11, 15 and 17 mm. wide. The largest number of radial canals observed was 32; in one exceptional case this number was found in a specimen only 9 mm. in diameter. In adult specimens more than 25 mm. wide the number of radial canals was at least 26.

TABLE VI.—*Dimensions of* Aequorea australis.

Diameter of umbrella (mm.)	Diameter of stomach (mm.).		Number of radial canals.		Number of tentacles.		Ratio of diameters of stomach and umbrella.	Ratio of number of tentacles and radial canals.
	Variation.	Average.	Variation.	Average.	Variation.	Average.		
2–5	1–2	1·55	8–19	11·8	4–16	9·0	1:2·4	1:1·3
6–10	2–5	3·1	12–32	19·0	9–23	15·1	1:2·6	1:1·27
11–15	3·5–5	4·55	16–32	24·0	14–31	21·4	1:2·9	1:1·14
16–20	5–8	6·5	16–32	26·9	18–33	25·4	1:2·8	1:1·06
21–25	5–10	7·8	16–32	26·7	24–36	28·6	1:2·9	1:0·93
26–30	7–11	9·8	26–32	30·2	27–32	29·8	1:2·8	1:1·0
33	12	12	28	28	35	35	1:2·8	1:0·8

The number of fully developed tentacles may amount to 36 (in a specimen 25 mm. wide), but is rarely more than 32, and this number may be attained, when the bell-diameter is about 18 mm. The average, as well as the limits of variation, in number of tentacles in specimens of different sizes are seen from Table VI. One young specimen, 2·5 mm. wide had only four tentacles and 12 young bulbs; another of the same size had eight fully developed tentacles. In specimens up to 5 mm. in diameter I have counted the following numbers :

Diam. (mm.)	2·5	3	4	5
Number of tentacles	4, 8	7, 8, 8, 10	12	8, 8, 12, 16

The average ratios of numbers of tentacles to radial canals are seen from Table VI; in young specimens the number of canals is almost always somewhat larger than the number of tentacles (ratio 1:1·3 in specimens up to 5 mm.), but the tentacles increase a little more rapidly in number than the canals, and when the umbrella is more than 15 mm.

wide there are usually about as many tentacles as canals. There is some variation, however ; extreme cases were :

Diameter (mm.)	13	17	21	22
Tentacles	14	30	28	26
Radial canals	24	19	19	16

The numbers found in the specimens from the Great Barrier Reef are in good accordance with the figures given by Uchida.

Comparison with A. globosa.—The description of *A. globosa* by Eschscholtz (1829, p. 110, pl. 10, fig. 2) was based on specimens taken in the Pacific near the Equator ; they were about 40 mm. high and wide, with a thick, dome-shaped apex, 30–32 radial canals and as many tentacles, and gonads reaching from the periphery of the stomach nearly to the ring-canal. Maas (1905, p. 43, pl. 8, figs. 48, 49, 50) and Stiasny (1928, p. 214) were probably right that their specimens from the Malayan Archipelago belong to the same species, which is mainly characterized by the shape of the umbrella, the comparatively small stomach, the approximately equal numbers of tentacles and radial canals, and the slender tentacle bulbs. It is not stated whether excretory papillae are present. Uchida has, in tabular form, compared it with his new species *A. australis*, and he found that " the relative numbers of tentacles and radial canals to the bell diameter given by Maas and Stiasny are distinctly different in these two species."

The extensive collection from the Great Barrier Reef has augmented the limits of variation in *A. australis*, and to some degree effaced the numerical difference between the two species, as far as young individuals are concerned, as will appear from the following table :

Table VII.—Aequorea australis *and* globosa.

Diam. of umbrella (mm.).	Width of stomach (mm.).		Number of radial canals.		Number of tentacles.	
	australis.	*globosa.*	*australis.*	*globosa.*	*australis.*	*globosa.*
8	3–4	3	15–25	29	10–23	29
9	4–5	4	19–32	30	12–18	28
10	3–4·5	4	17–27	27	12–19	27
11	4–4·5	5	16–20	30	14–19	30
12	5	5–6	20–32	32–48	20–25	30–48
14	3·5–5	–	25–32	44	20–31	45
16	5–7	7	24–32	38	18–32	38
20	8	9	22–30	48–49	26–30	48–49

The relative width of the stomach presents no difference between these species, but with increasing age *A. globosa* attains a considerably higher number of radial canals and tentacles than *A. australis*. The characteristic highly vaulted shape of the umbrella in *A. globosa* is only occasionally seen in very young specimens of *A. australis*. Moreover it is expressly stated by Maas and Stiasny that the gonads of *A. globosa* occupy almost the entire length of the radial canals, even in fairly young specimens, which is in striking contrast to the conditions in *A. australis*. I have been able to examine the specimens of

A. globosa previously described by Stiasny and kindly lent to me by the Rijksmuseum van Natuurlijke Historie in Leiden. They are very different from *A. australis* and, above all, there is not the slightest trace of an excretory papilla on the tentacle bulbs. This removes any doubt, and I consider *A. australis* a well-distinguished form specifically different from *A. globosa*.

TABLE VIII.—*Seasonal Occurrence of* Aequorea australis.

Month.	VII.	VIII.	IX.	X.	XI.	XII.	I.	II.	III.	IV.	V.	VI.	VII.
Estimated average number of specimens per one haul	1	2	1	9	3	33	1	2	10	4	2	3	4
Diam of umbrella (mm.).	2–17	3–15	7–10	2–22	4–25	2–33	5	12–18	3–15	7–22	5–38	4–18	?
Average diam (mm.).	10·3	8·3	7·75	9·9	16·0	19·0	5	15·5	6·8	13·0	17·0	9·2	?

Seasonal Occurrence of Aequorea australis (see Table VIII).—This species occurred in slightly varying numbers throughout the whole period from 30th July, 1928, to 17th July, 1929, but as a rule only some few specimens were taken in each of the numerous hauls. It was only plentiful in December, when the estimated average number of specimens per one haul was 33. The collection from this month contains specimens of all sizes, 8–33 mm. at St. XXXII, 2·5–29 mm. at St. XXXV. Its habitat is distinctly neritic; only on one occasion (St. XXVIII) was it taken outside the reefs. Young specimens were taken at all seasons; the irregular seasonal occurrence of adult specimens, as it appears from Table VIII, may be due to the scarcity of the species in some periods, during which the samples are not representative, the more so because adult specimens of a medusa of this size are not easily caught in nets of the types used by this expedition.

Aequorea macrodactyla (Brandt).

Mesonema macrodactylum Brandt, 1838, Mém. Ac. St. Pétersbourg, **4**, 2, p. 359, pl. 4.
Polycanna purpurostoma Agassiz & Mayer, 1899, p. 169, pl. 8, figs. 26–28.
Aequorea maldivensis Browne, 1904, p. 732, pl. 56, figs. 4–12.
Mesonema macrodactylum, Maas, 1905, p. 40, pl. 8, figs. 51, 54.
Aequorea macrodactylum, Bigelow, 1909, p. 174, pl. 36, figs. 5–10; Bigelow, 1919, p. 313, pl. 43, fig. 7.
Aequorea macrodactyla, Mayer, 1910, p. 333; Browne, 1916, p. 189; Menon, 1932, p. 23; Thiel, 1938, p. 332, text-fig. 9; Uchida, 1938, p. 146; Russell, 1939, p. 350.
Mesonema coelum pensile, Vanhöffen, 1911, p. 230 (in part).

Material.—20 specimens were taken in 13 hauls between 2nd October and 13th February (Sts. XV–XLI, see Table XVIII). Their occurrence was rather scattered within this period. The majority of the specimens were young stages, from 2 mm. wide upwards, only three being more than 20 mm. in diameter (up to 35 mm.).

Remarks on Morphology and Development.—In all specimens, from the youngest stages to the largest individuals, the tentacle bulbs have the shape characteristic of *A. macrodactyla*, with a distinct abaxial "clasp" or "spur" in contradistinction to *A. pensilis*. This difference between the two species has been pointed out mainly by Browne and Bigelow; in *A. pensilis* the marginal bulbs have an excretory pore, but no trace of a papilla, as shown by Browne (1905, p. 148) in microtome sections. The distance between the tentacles is more or less irregular, and accordingly the number of young marginal bulbs between successive tentacles is variable; in a specimen 30 mm. in diameter with 32 fully developed

tentacles the number of young bulbs was most frequently three, the median one being somewhat larger than the others; when it has reached a certain size, two more minute bulbs appear in the same space. In reality all the small marginal warts have the potentiality of developing into tentacles. In this specimen the statocysts alternate, more or less, with the tentacles + bulbs.

Development (see Table X).—Two individuals are only 2 mm. in diameter; one of them has eight radial canals and nine tentacles, in the other one the number of canals is 16 alternately well developed and very thin and narrow, and it has only seven tentacles. One specimen is 3 mm. wide with 12 canals and only four tentacles. Diameter 4 mm., three specimens, each with eight tentacles (in one of them four of the tentacles are very small); one has 28 radial canals, another 30, and in the third there are 16 fully developed and 16 blindly ending canals. In one of these specimens the umbrella is as high as wide with a thick gelatinous projection similar in shape to *A. conica* (see above). The further development of tentacles and radial canals is very irregular. Most of the specimens up to 14 mm. in diameter have only eight tentacles, but two (about 6 mm. wide) have 14 and 21; 32 canals are counted in specimens 6 to 14 mm. wide. One specimen, 23 mm. wide, has only 16 tentacles, and the largest specimen, 35 mm. in diameter, has 62 radial canals but only 12 fully developed tentacles. Blindly ending canals are observed in specimens of the following sizes: diam. 4 mm. (16 fully developed + 16 blind canals), 6 mm. (26 + 3), 7·5 mm. (31 + 11), 15 mm. (23 + more than 21), and 23 mm. (20 + about 15).

Affinities.—A. macrodactyla has been well described and figured by Maas (1905), Bigelow (1909 and 1919), and Browne (1916); all these authors regard it as distinct from *A. pensilis*, whereas Russell (1939) is inclined to consider them as two varieties of one species. This question will be discussed below. *A. maldivensis* was described by Browne (1904), but Bigelow (1909) and Browne himself (1916) have realized that it is identical with *macrodactyla*. Bigelow (1919, p. 310) has also discussed its relation to *A. aequorea*, and I think he is right in the following conclusion: " . . . we have here, as so often, a bimorphic Medusa with two fairly distinct types, with the great majority of specimens belonging to one or the other. However, since intermediates seem to be rare, the species *macrodactylum* may be retained, until the normal range of variation is better understood." In the same paper Bigelow opposed Vanhöffen (1911) in his attempt to unite several species under the name of *Mesonema coelum pensile*.

Distribution.—Aequorea macrodactyla is widely distributed in the warm parts of the Indian and Pacific Oceans from Africa to America, and Thiel (1938) records it from Walvis Bay on the west coast of Africa. According to Russell (1939) it may also be met with in the English Channel. Mayer (1915, p. 160) includes this species in his list of medusae found in the Torres Strait.

Aequorea pensilis (Haeckel).

Medusa coelum pensile Modeer, 1791, p. 32.

Mesonema pensile Haeckel, 1879, Das System der Medusen, p. 226; Browne, 1904, p. 733, pl. 55, fig. 4, pl. 57, figs. 2–9; Browne, 1905, p. 147, pl. 2, figs. 11–15; Maas, 1905, p. 42, pl. 8, fig. 52; Browne, 1916, p. 188.

Aequorea pensilis, Mayer, 1910, p. 333.

Mesonema coelum pensile, Vanhöffen, 1911, p. 230 (in part).

Aequorea pensile, Bigelow, 1913, p. 41; Bigelow, 1919, p. 311, pl. 42, figs. 3, 4; Menon, 1932, p. 24.

I agree with Bigelow (1919) that Haeckel and not Modeer should be quoted as the author of this species.

Material.—This species had a scattered occurrence; 11 specimens were collected between 16th November, 1928 (St. XXV) and 18th March, 1929 (St. L). This latter station was outside Papuan Pass, where two specimens were taken in vertical hauls 170–0 m. (the largest specimen in the collection, about 60 mm. in diameter) and 150–0 m. (young stage, only 3 mm. wide). The other finds were on or inside the reefs (see Table XVIII).

Remarks on the Specimens.—The specimens varied in diameter from 2 to about 60 mm., without any relation to the seasons. The dimensions are as follows (see Table IX):

TABLE IX.—*Dimensions of* Aequorea pensilis.

Station no.	Diam. of umbrella (mm.).	diam. of stomach (mm.).	Number of radial canals.	Number of tentacles.
XXXIV	2	1	?	4
L	3	2	27	?
XLI	4	3	16	4
XLVI	4	3	27	8
XXXV	8	5·5	33	8
XXXV	9	5	31	8
XXXV	12	6	36	8
XXXII	14	10	*c.* 85	8
XXV	29	16	57	16
XXXII	52	32	142	12
L	*c.* 60	*c.* 35	*c.* 190	*c.* 17

It is generally stated that the umbrella of this medusa is plano-convex or almost lens-shaped; this does not apply to the young specimens, in which the subumbrella is flat or slightly concave, whereas the exumbrella is more or less vaulted. Two of the small specimens, 2 and 4 mm. in diameter, are almost as high as wide, the apical mass of jelly being highly vaulted and constituting almost three-quarters of the entire height of the umbrella.

In the youngest specimen, 2 mm. wide, I could not see the radial canals; it has four tentacles and four large marginal bulbs. In the next specimen, 3 mm. wide, the margin is somewhat damaged and the number of tentacles could not be counted. One of the specimens 4 mm. wide has four tentacles, four large and eight small marginal bulbs; alternating with the 16 fully developed radial canals are 16 very short, blindly ending canals; no traces of gonads. The specimen 8 mm. wide has 11 blind canals between the 33 fully developed, and in the specimen 12 mm. wide there are five blind canals; in this specimen almost every alternate fully developed canal is quite thin. In the specimen from St. XXXII, 52 mm. in diameter, the development of additional radial canals is irregular; some few canals without gonads are scattered here and there, but within a space of nearly one-quarter of the circumference canals with and without gonads are almost regularly alternating; altogether it has 142 canals and about the same number of short, narrow, almost linear mouth-lips. The largest specimen, about 60 mm. wide, is discoloured by rust and quite opaque,

and the umbrella is split in various directions; exact measurements and counts could, therefore, not be carried out in this specimen.

Comparison between A. macrodactyla *and* pensilis.—All records in the literature agree that as a rule adult specimens of *A. macrodactyla* have only about half the number of radial canals as *A. pensilis*, but the number of canals as well as tentacles is variable in both species. Russell (1939), who has examined a considerable number of specimens from the English Channel, has discussed the relation between the two species, and by means of all the counts and measurements available in the literature he arrives at the following conclusion (p. 354): " . . . there is a tendency towards two distinct groupings into *Aequorea macrodactyla* and *A. pensilis*. Yet this distinction does not seem to be sufficiently clear to warrant their separation into two species. It is preferable to regard them all as belonging to one species, *A. pensilis*, with a variety, *macrodactyla*, in which only half the full number of radial canals is developed."

TABLE X.—*Relative Dimensions of* Aequorea macrodactyla (*m*) *and* pensilis (*p*).

Diam. of umbrella (mm.).	Diam. of stomach (mm.).		Number of radial canals.		Number of tentacles.	
	m.	*p.*	*m.*	*p.*	*m.*	*p.*
2	1	1	8	?	9	4
2	1·2	–	16	–	7	–
3	2	2	12	27	4	?
4	2	–	28	–	8	–
4	2·5	3	16	16	4	4
4	2·5	3	28	27	8	8
4·5	3	–	30	–	8	–
6	3·5	–	14	–	8	–
6	3·5	–	26	–	8	–
6	3	–	16	–	21	–
6	5	–	32	–	14	–
8	4	5·5	31	33	8	8
9–10	5	5	32	31	8	8
12	–	6	–	36	–	8
14	8	10	32	*c.* 85	8	8
15	8	–	23	–	18	–
20	13	–	50	–	28	–
23	9	–	20	–	16	–
29–30	16	16	70	57	32	16
35	17	–	62	–	12	–
52	–	32	–	142	–	12
c. 60	–	*c.* 35	–	*c.* 190	–	*c.* 17

In Table X are given the dimensions of all the specimens taken by the Great Barrier Reef Expedition; they are separated into two groups by means of the shape of the tentacle bulbs, and the figures in the table show that in young specimens the numerical values are very similar in both, and in larger specimens they are very variable. Quite exceptional

cases may occur, such as the two specimens of *macrodactyla*, 23 and 35 mm. wide, with respectively only 16 and 12 tentacles. The width of the stomach gives no clue whatever to distinguish between two forms within the size-limits represented in this collection. So far I agree with Russell that a numerical distinction between these two forms cannot be recognised with certainty in all cases.

On the other hand, the difference in the shape of the tentacle bulbs seems to me to establish a perfectly sound foundation for a specific separation. The presence of a distinct abaxial clasp or spur and a prominent adaxial excretory papilla in the tentacle bulbs of *A. macrodactyla* in contradistinction to *A. pensilis*, in which the bulbs have " long lateral extensions," has repeatedly been emphasized by Browne and Bigelow. Russell has seen the same difference and given an excellent drawing of the bulb of *A. macrodactyla* (1939, p. 352, fig. 2*d*), but " the true condition of spur and ridge is only seen when the specimens are perfectly preserved." The present specimens from the Great Barrier Reef cannot be said to be in perfect condition, but, nevertheless, the abaxial spur with its longitudinal ridge and the prominent adaxial papilla are clearly visible in some specimens (which I refer to *macrodactyla*) and as clearly absent in the others (referred to *pensilis*) ; in no instance was I in doubt. I am very much inclined, therefore, to retain *A. macrodactyla* and *pensilis* as two distinct species in spite of their occasional overlap in numerical characters.

Distribution of Aequorea pensilis.—Widely distributed in the tropical parts of the Indian and Pacific Oceans, recorded with certainty from the Red Sea, the Maldive Islands, the coasts of India and Ceylon, the Chagos Archipelago, French Indo-China, the Malayan Archipelago, the Philippines, Japan, and as far east as Tahiti, but not previously known from Australia. Vanhöffen's records from the Galapagos Islands, China, South Africa, and Ascension and the Tortugas in the Atlantic are uncertain, because at least some of his specimens belonged to other species. The numerous specimens from the British waters mentioned by Russell all seem to belong to *A. macrodactyla*, considered by him to be a variety of *A. pensilis*.

Limnomedusae.

Olindias singularis Browne.

Olindias singularis Browne, 1904, Fauna and Geogr. of Maldive and Laccadive Archips. 2, p. 737, pl. 56, fig. 2, pl. 57, fig. 1 ; Bigelow, 1909, p. 109, pl. 4, fig. 1, pl. 31, figs. 1–10, pl. 32, fig. 8 ; Mayer, 1910, p. 357 ; Browne, 1916, p. 192 ; Bigelow, 1919, p. 318 ; Stiasny, 1931, p. 27 ; Menon, 1932, p. 27.

Material.—

St. XLIV, S. 27.ii.29. Li.I. 11 specimens ; diam. 3–10 mm.
St. XLIV, C. 27.ii.29. Li.I. 2 specimens ; diam 3–7 mm.
St. XLVI, S. 28.ii.29. I.C.P. 1 specimen ; diam 2 mm.
St. XLVII, S. 4.iii.29. 3 miles E. 2 specimens ; diam. 3 mm.

I agree with Bigelow (1919) that this is a distinct species which is mainly characterized by the statocysts being single at the base of the primary tentacles and not paired as in all other species of *Olindias*. It is true that in large specimens paired statocysts may be found at the bases of a few of the tentacles as observed by all the authors quoted above, and also by Browne himself (1916). Bigelow emphasizes the interesting fact that " when paired otocysts are developed, they are both distinguishable when the tentacle is very small. There is no evidence that tentacles which have one otocyst during the greater

part of their history ever acquire a second one at a late stage." In the specimens from the Great Barrier Reef, all of which are young ones, the statocysts are invariably single.

TABLE XI.—*Dimensions of the Present Specimens of* Olindias singularis.

Diam. (mm.).	Height (mm.).	Number of centripetal canals per quadranth.	Number of primary tentacles.	Number of secondary tentacles.	Gonads.
3	2·5	1	8	Tiny rudiments	Lacking
3	2·5	1	8	,, ,,	,,
3	2	1	8	,, ,,	,,
4	?	1	8	,, ,,	,,
5	4	3	16	,, ,,	,,
5·5	4	3	16	2 + rudiments	,,
6	4	3	16	4 + ,,	,,
7	6	3 + rudiments	17	6 + ,,	Tiny.
8	6	3	16	4 + ,,	,,
9	7	3 + rudiments	*e.* 24	8 + ,,	,,

Distribution.—Maldive Islands (Browne, 1904), Chagos Archipelago (Browne, 1916), Madras (Menon, 1932), Philippines (Bigelow, 1919), Low Archipelago (Bigelow, 1909); Michaelmas Reef, Cay, off Cairns, Queensland (Stiasny, 1931). Thus this species has an extensive distribution in the Indo-Pacific region, and it has been found on the coast of Queensland before it was taken there by the Great Barrier Reef Expedition.

Proboseidactyla ornata (McCrady).

Material.—

St. XXXIV, S. 19.xii.28. 3 miles E. 1 specimen, 3 mm. wide with 16 tentacles.

The specimen does not in any way differ from the usual appearance of this species, which has a wide distribution in the warm parts of the Indo-Pacific and Atlantic Oceans. It has not previously been recorded from Australia.

TRACHYMEDUSAE.

Haliereas minimum Fewkes.

Halicreas minimum Fewkes, 1882, Bull. Mus. comp. Zool. Harvard, **9**, p. 306.
Halicreas papillosum Vanhöffen, 1902, p. 68, pl. 9, figs. 7–8, pl. 11, fig. 30.

Material.—

St. XXVIII, O.T.O. 23.xi.28. S. 600–0 m. 1 specimen; 10 mm. wide.

Distribution.—Widely distributed in the deep parts of all the oceans, except in the Mediterranean and the arctic seas.

Rhopalonema velatum Gegenbaur.

Rhopalonema velatum Gegenbaur, 1856, Zeitschr. f. wiss. Zool. **8**, p. 251, pl. 9, figs. 1–5.
Rhopalonema clavigerum Haeckel, 1879, p. 263, pl. 17, figs. 1, 2.
Rhopalonema coeruleum Haeckel, 1879, p. 264, pl. 17, figs. 3–6.
Rhopalonema striatum Maas, 1893, p. 15, pl. 1, figs. 3, 4.

Material.—

St. XVI, closing silk townet, 20 m. wire. 3.x.28. 3 miles E. 1 specimen.
St. XIX, N. 180–0 m. 20.x.28. O.T.O. 2 specimens.
,, do. 2nd haul. 20.x.28 O.T.O. 1 specimen.
St. XXVIII, S. 600–0 m. 23.xi. 28. O.T.O. 1 specimen.
,, C. 580–0 m. 23.xi.28. O.T.O. 1 specimen.
St. L, S. 400–0 m. 18.iii.29. O.P.P. 2 specimens.
,, 170–0 m. 18.iii.29. O.P.P. 1 specimen.

The specimens varied in size between 2·5 and 8 mm. in diameter. Most of them were taken in the deep areas outside the reefs.

Distribution.—Common in the warmer parts of all the oceans, including the Mediterranean, in the upper as well as in the deep strata. Recorded from the Torres Strait by Mayer (1915, p. 202).

Amphogona apsteini (Vanhöffen).

Pantachogon apsteini Vanhöffen, 1902, Wiss. Ergeb. deutsch. Tief-See Exp. **3**, p. 65, pl. 10, fig. 18, pl. 11, fig. 28.
Amphogona apsteini, Browne, 1904, p. 740, pl. 54, fig. 5, pl. 56, fig. 1, pl. 57, figs. 10–15 ; Bigelow, 1909, p. 126, pl. 2, figs. 1, 2, pl. 34, figs. 12–15, pl. 45, fig. 10.

Material.—27 specimens of this little medusa were collected in October to December, 1928, and March to June, 1929, mainly in the inshore waters and rarely more than one or two specimens in each haul (see Table XVIII). The size of the specimens varied between 2 and 4 mm. in diameter.

Distribution.—Kathiawar in north-western India ; Maldive Islands ; Farquhar Islands, Cargados Carajos, and Chagos Islands in the Indian Ocean ; Sumatra ; Pelew Islands in the Pacific ; Japan ; Pacific coast of Mexico.

Aglaura hemistoma Péron & Lesueur.

Material.—This was the most abundant of all the species of Hydromedusae in the collection from the Great Barrier Reef Expedition. The number of specimens preserved amounts to 891 (see Table XVIII), but the species was not equally common at any time. The size of the specimens varied between 1·5 and 4 mm. in height of the umbrella, and the limits of variation were the same throughout the year, so that this truly oceanic medusa has no definite breeding season. Nevertheless its occurrence in the Great Barrier Reef

TABLE XII.—*Seasonal Occurrence of* Aglaura hemistoma.

Month.	VII.	VIII.	IX.	X.	XI.	XII.	.	I.	II.	III.	IV.	V.	VI.	VII.
Average number of specimens per haul	22	60	6	65	5	70	.	3	0·1	11	530	105	170	40

area falls within two distinctly separated periods, as will be seen from Table XII. It was common in August, October and December (less frequent in September and November) and particularly abundant in April–June the next year, whereas it was almost completely lacking from January to March. This may be due either to hydrographical conditions or to a temporary decrease in the activity of breeding.

Distribution.—Generally distributed in the warm parts of all the oceans, including the Mediterranean, approximately between the isotherms of 20° C. for the warmest months in north and south. It occurs as far north as Japan and California in the Pacific, and the Gulf of Maine and the Bay of Biscay in the Atlantic. In spite of its evident abundance in the surrounding regions it has been recorded from Australian waters only once before (Torres Strait, by Mayer, 1915, p. 160).

Geryonia proboscidalis (Forskål).

Material.—

St. XVI, closing silk townet, 10 m. wire. 3.x.28. 3 miles E. 1 specimen ; 4 mm. wide.
St. XIX, stramin net, 180–0 m. 20.x.28. O.T.O. 1 specimen ; 8 mm. wide.
St. XX, N. 250–0 m. 20.x.28. O.T.O. 1 specimen ; about 10 mm. wide.

The specimen from St. XIX was in fair condition with well-extended tentacles.

Distribution.—Widely distributed in the warm parts of all the oceans, including the Mediterranean. Recorded from Endracht's Land in Western Australia under the names of *Dianaea endrachtensis* Quoy & Gaimard, 1824, and *Geryonia dianaea* Haeckel, 1879, and from the coast of Australia (without further details) as *Carmaris giltschii* Haeckel, 1879.

Liriope tetraphylla (Chamisso & Eysenhardt).

When I first examined the extensive collection of *Liriope* from the Great Barrier Reef I thought I could distinguish two or perhaps three different species, but after a closer examination I must admit that the authors (Browne, Thiel, Bigelow, Russell) who consider all the numerous forms which have been described as belonging to one species are probably right. The majority of the specimens are very small and present no specific characters at all. The largest specimens are mainly of the *compacta* type with broadly triangular gonads with rounded angles and touching each other in the interradii. In middle-sized specimens the gonads are generally more or less trapezoid, and the distal end of the radial canals is very broad, but sometimes the gonads are heart-shaped, placed near the proximal end of the radial canals. The length and width of the centripetal canals were likewise very variable. Altogether it has proved impossible to divide the specimens into characteristic groups, and I prefer, therefore, to deal with the entire collection as belonging to one species.

TABLE XIII.—*Seasonal Occurrence of* Liriope tetraphylla.

Month.	VII.	VIII.	IX.	X.	XI.	XII	.	I.	II.	III.	IV.	V.	VI.	VII.
Average number of specimens per one haul	1	3	1	3	5	23	.	95	68	46	6	6	3	13
Diam. of umbrella (mm.).	5	3–9	1–8	2–9	1–8	2–13	.	2–8	2–7	1–7	3–7	4–17	3–6	4–11

Material.—*Liriope* was found in almost every haul, and altogether 834 specimens were preserved (see Table XVIII). The medusae were not equally numerous throughout the time of investigation (see Table XIII) ; there was a rapid increase in number of speci-

mens from November to January, when a distinct maximum was reached, to be followed by a decrease during the following months. The short and very distinct period of maximal occurrence is remarkable considering the truly oceanic habitat of this medusa. Young and middle-sized specimens were found at any time ; adult specimens were altogether rare in the samples and were taken only occasionally and at irregular intervals. Breeding evidently takes place throughout the year, but with a distinct maximum of intensity in December to February.

Distribution.—Liriope tetraphylla is generally distributed in the tropical and subtropical parts of all the oceans, mainly in the upper strata, but it may also sometimes be taken deeper down. The southern limit of distribution is at about 40° S., coinciding with the 20° isotherm. It is common in the Mediterranean, and in the Atlantic it reaches as far north as the Gulf of Maine on the American coast and to the entrance of the English Channel. In the Pacific it is found on the coasts of California and Japan. It was recorded from the Torres Strait by Mayer (1915, p. 160) as *L. rosacea.*

Narcomedusae.

Solmundella bitentaculata (Quoy & Gaimard).

Solmundella bitentaculata, Browne, 1904, p. 741, pl. 56, fig. 3 ; Browne, 1905, p. 153, pl. 4, figs. 1–6 ; Vanhöffen, 1908, p. 45, pl. 3, figs. 11–15 ; Bigelow, 1909, p. 77, pl. 2, fig. 3 ; Mayer, 1910, p. 455, text-fig. 301.

Material.—

St. XXXII, S. 5.xii.28. 3 miles E. 1 specimen ; diam. 4 mm.
St. XXXV, S. 27.xii.28. 3 miles E. 1 specimen ; diam. 1·2 mm.
St. XXXVI, S. 4.i.29. 3 miles E. 1 specimen ; diam. 2 mm.
St. L, S. 400–0 m. 18.iii.29. O.P.P. 4 specimens ; diam. 2 mm.
„ C. 150–0 m. 18.iii.29. O.P.P. 1 specimen ; diam. 3 mm.

Distribution.—This small, oceanic medusa is widely distributed in all the great oceans, including the Mediterranean. It is particularly common in the southern hemisphere, even in the immediate neighbourhood of the Antarctic Continent, but it also penetrates northwards as far as the Sea of Ochotsk in the Pacific and to about 45° N. in the Atlantic. It is probably this species which is recorded from the Torres Strait by Mayer (1915, p. 160) as *Solmundella mediterranea.*

Solmaris rhodoloma (Brandt).

Aequorea rhodoloma Brandt, 1838, Mém. Acad. Sci. St. Pétersbourg, 4, 2, p. 357, pl. 3, figs. 1–5.
Solmaris rhodoloma, Haeckel, 1879, p. 358 ; Maas, 1909, p. 39, pl. 3, fig. 20 ; Uchida, 1928, p. 85, text-fig. 5.
non *Solmaris rhodoloma*, Vanhöffen, 1908, p. 60, pl. 7, fig. 5.

Material.—

St. XXXIX, F. 30.i.29. 3 miles E. 80 specimens.

It is rather peculiar that a shoal of this medusa should suddenly turn up and be taken in one single haul with the fine silk net, whereas it was not taken in the hauls with the coarse silk net and the stramin net on the same day, nor on any other occasion during the investigations at the Great Barrier Reef. Seventy-three specimens were measured as follows :

Diam. (mm.).	Number of specimens.	Number of lappets and tentacles. Limits of variation.	Average.
1	1	14	14
1·5	0	–	–
2	13	19–25	21·7
2·5	24	20–28	23·9
3	30	21–28	25·1
3·5	4	22–25	23·5
4	1	28	28

The number of marginal lappets and tentacles thus increases during the growth of the medusa. In the largest specimens the gonads are well developed, though apparently not quite ripe. The umbrella margin is rolled more or less inwards in all the specimens ; the marginal sense organs are therefore difficult to see, but in some cases I have been able to state that there are one or two on each marginal lappet, occasionally three. Most of the tentacles are well extended, and considerably longer than the diameter of the umbrella.

These specimens undoubtedly belong to the same species as that described and beautifully figured by Maas (1909) from Sagami Bay in Japan and later by Uchida (1928) from the same locality. According to Maas specimens 3 mm. wide have 24–28 tentacles ; Uchida gives the following numbers : diam. 2·2 mm. 17 tentalces, 3·2 mm. 28 tentacles, 7·0 mm. 32 tentacles. Both authors agree that each of the marginal lappets carries one or two sense organs. The agreement between the Japanese and the Australian specimens is thus complete, and though Brandt's description of the original specimens from Concepcion Bay on the coast of Chile (about 37° S.) is rather vague, it seems to me very probable that the Japanese as well as the Australian specimens belong to the same species.

Mayer (1910, p. 437) is inclined to refer Brandt's medusa to *S. corona* ; this is, however, a larger medusa, up to 15 mm. in diameter, and young specimens 2–4 mm. wide have only 12–18 tentacles. Thiel (1936, p. 58) refers it to *S. flavescens* together with several other species of this genus, but when *flavescens* has attained a size of 23 mm. it has only 12–17 tentacles. It seems to me open to objection to refer *S. rhodoloma* to these or any other of the Mediterranean and Atlantic species of *Solmaris*. Uchida (1947, p. 314) records *S. corona* from the Pelew Islands in Central Pacific, but he gives no information of the dimensions of the specimens ; they may have belonged to *rhodoloma*. All Vanhöffen's determinations of Solmarids (1908, 1912*a* and *b*) are open to doubt ; his specimens of "*Solmaris rhodoloma*" from Cape of Good Hope and south of St. Paul, which were 71–82 mm. in diameter, most probably belong to the genus *Solmissus*. *Solmaris rhodoloma* might still be compared with *S. lenticula* Haeckel (1879, p. 357). This is a small medusa, found in the Indian Ocean, 5 mm. wide, with 16 tentacles, and with one sense organ on each of the 16 marginal lappets ; Mayer (1910, p. 438) considered it an immature form of uncertain affinities. While on the "Galathea" expedition I visited the Philippines in 1951 ; I found several specimens of a small medusa, which I believe may be referred to *S. lenticula* ; they were 2–3 mm. wide with 13 tentacles, and accordingly quite different from *S. rhodoloma*.

Distribution of Solmaris rhodoloma : Concepcion Bay, Chile ; Sagami Bay, Japan ; perhaps Pelew Islands in Central Pacific, and now taken at the Great Barrier Reef, Australia.

Cunina octonaria McCrady.

Cunina octonaria McCrady, 1857, Proc. Elliot Soc. Nat. Hist. **1**, p. 109, pl. 12, figs. 4, 5.
Cunoctantha octonaria, Haeckel, 1879, p. 316.

Bigelow (1909, p. 51) has demonstrated that a peripheral canal system may or may not be present in *Cunina* as well as in *Cunoctantha*, so that the two genera differ only in the number of tentacles, eight in *Cunoctantha* and other numbers in *Cunina*, usually nine or more, but sometimes seven. In a subsequent paper (Bigelow, 1918, p. 391) he further points out that the two genera "are so closely allied (differing only in the number of tentacles) that they may finally be united. But until an intergradation is actually observed, it is wisest to retain both." Such intergradations have really been observed. Already Haeckel, who established the genus *Cunoctantha*, found individual variation in the number of tentacles, which was not absolutely constant ("bald 7, bald 9, selten höhere Zahlen"). Uchida (1928, p. 87) describes some young medusae from Japan under the name of *Cunina* sp.; they were 1·6–3·0 mm. in diameter, and among the six specimens observed three had eight tentacles, two had nine, and one 11 tentacles. In the collection from the Great Barrier Reef expedition the majority of the specimens have eight tentacles, but there are also two specimens with only seven, one with nine tentacles (one of which is quite small), and one with 10 tentacles, which are approximately but not quite equidistant, and one of them is very small. All these specimens are of almost the same size, 2·7–3·2 mm. wide, and in structure they are exactly like the typical specimens with eight tentacles. The number of tentacles seems to me, therefore, to be of specific value only and not sufficient to distinguish between two genera. In a previous paper (Kramp, 1948*b*, p. 18) I described a new species, *Cunina frugifera*, in which larvae were developed by external budding from the stomach wall; the parent medusa had nine tentacles, whereas the larvae had eight, and I indicated the possibility of a metagenesis "in which an asexual generation with nine (or more) tentacles alternates with a sexual generation with eight tentacles." We also know that the small medusae developed inside the stomach cavity of the 8-rayed *Cunina octonaria* may have 9–13 tentacles.

TABLE XIV.—*Seasonal Occurrence of* Cunina octonaria.

Month.	VII.	VIII.	IX.	X.	XI.	XII.	I.	II.	III.	IV.	V.	VI.	VII.
Estimated average number of specimens per haul	0	1	0·1	0·3	12	66	36	0	1	0	1	1	0
Diam. of umbrella (mm.)	–	2–3·5	3	2·7–3·2	2–6	2–5	2·5–4	–	2–4	–	3	3	–

The limitation of the numerous species of *Cunina* and *Cunoctantha* which have been described will not be discussed here. In the present collection the number of sense organs on the marginal lappets varied from 3 to 5, sometimes even within one and the same individual.

Material.—119 specimens were preserved, varying in size from 2 to 6 mm. in diameter. The species had a scattered occurrence almost throughout the period of investigation (see Tables XIV and XVII), with a distinct maximum in December, but there was no correlation between the seasons and the sizes of the specimens.

Distribution.—Widely distributed in the warm parts of all the oceans, including the

Mediterranean, though apparently rather scarce in the Indian and Pacific Oceans ; mainly found in the upper strata. According to Thiel (1936, p. 85) it penetrates as far north in the Atlantic as to the Bay of Biscay ; the only specimen taken there, however, was *C. fowleri* Browne, which seems to be a distinct species.

Parasitic Stolon-larvae of Cunina.

(Plate II, fig. 7.)

In the sample from St. L, outside Papuan Pass, 18.iii.29, stramin net 170–0 m., was found a specimen of *Liriope tetraphylla* with two narcomedusan larvae attached to the inner wall of the stomach. Each of them consists of a stolon carrying numerous medusa buds. Both are attached to the upper part of the stomach ; one is about 2 mm., the other 2·4 mm. in length, with respectively 1 mm. and 1·6 mm. hanging outside the mouth of the *Liriope*. There are medusa buds in all stages of development from tiny globular knobs to well-developed small medusae 0·5–0·6 mm. in diameter with a somewhat conical manubrium, a simple, round mouth opening, eight marginal lappets and eight short, egg-shaped tentacles. Buds in different stages of development are scattered irregularly over the surface of the stolons.

These larvae are very similar to the stolon-larvae of various species of *Cunina* found in the mouth of *Geryonia* or *Liriope*, described and discussed by several authors, first by F. Müller (1861), who saw this peculiar structure in the mouth of a *Liriope* on the coast of Brazil ; he found that the small medusae budded off from the stolon were so like the 8-rayed form of his *Cunina köllikeri* (which is generally considered identical with *C. octonaria*) that most probably they were derived from that species. Later on similar stolons were observed attached to *Geryonia* in the Mediterranean. Mayer (1910, p. 465, pl. 54, fig. 4) found a stolon-larva floating in the ocean at Tortugas, Florida, and considered it as probably one of the generations of *Cunoctantha köllikeri*. Maas (1905, p. 67) described the development of *Cunina* larvae in the stomach of *Cunoctantha octonaria* from the Malayan Archipelago, but stolon-larvae in the mouth of Geryonidae were not seen by him.

Stolon-larvae of this peculiar appearance have now for the first time been observed outside the Mediterranaen and Atlantic Oceans. The structure of the medusa buds leaves no doubt of their affinity ; they are undoubtedly the asexual offspring of a *Cunina*, and I suspect that they belong to *C. octonaria*, the only species of this genus hitherto recorded from the surroundings of Australia, though of course we cannot exclude the possibility of their belonging to some other species.

PREVIOUS RECORDS OF HYDROMEDUSAE IN AUSTRALIAN WATERS.

Very little attention has been paid to the fauna of medusae in the waters around Australia. Hydromedusae are mentioned in 11 papers (Lendenfeld's series counted as one) dating from 1809 to 1947, and most of the " species " are insufficiently described or quite obsolete in the sense that they cannot be identified with any known species.

In the classical work by Péron & Lesueur (1809) no less than 27 species of medusae are recorded from Australian coasts, and all of them were described as new species. Seven species were Scyphomedusae, 20 seem to be Hydromedusae. The atlas, which was intended to accompany the text, was never issued, but some of the figures were published

later on, partly by De Blainville (1834, Manuel d'Actinologie), partly by Milne Edwards in Cuvier's Règne Animal (1839); Haeckel saw the unpublished plates in the library in Jardin des Plantes in Paris and gave his opinion on the affinities of the species (Haeckel, 1879).

The following eight species of Hydromedusae were rightly designated by him as obsolete: *Aequorea sphaeroidalis*, *A. amphicurta*, *A. bunogaster*, *A. phosperiphora*, *Phorcynia cudonoidea*, *P. petasella*, *P. istiphora*, and *Callirhoë micronema*. It may be worth while to say a few words about the remaining 12 species, though none of them can be identified with certainty.

Eudora undulosa, Péron & Lesueur, p. 326, found at De Witt's Land in north-western Australia; Blainville, pl. 30, figs. 1–3; Cuvier, pl. 54, figs. 5, 5*a*, 5*b*. Haeckel (p. 648) is inclined to regard this as the umbrella of a "Cannotide." It seems to me very probable that it was the same species, which was described by Stiasny (1928, p. 218, text-figs. 5*a*–7) as *Zygocanna buitendijki* from the Java Sea. The repeatedly branched radial canals and the numerous prominent radial ridges on the exumbrella are very characteristic in both species. *E. undulosa* was, however, considerably larger, being 80 mm. in diameter against 33 mm. in *Z. buitendijki*.

Berenix thalassina, P. & L., p. 327, Arnhem Land in northern Australia. Haeckel (p. 160) considers this species identical with *Berenix euchroma*, described by Péron on the same page. This latter was found in the tropical Atlantic, and a figure of it is reproduced by Blainville (pl. 32, fig. 1) and Cuvier (pl. 53, fig. 2). For the two species combined Haeckel used the name *Cladocanna thalassina*; as locality he only gives Arnhem Land. Maas (1904*a*, p. 441) and Mayer (1910, p. 228) referred the species to *Toxorchis*, and this may be right, but it seems to me far from being a certainty. At least, it is rather different from the two other species of that genus, *arcuatus* Haeckel from the Canary Islands and *kellneri* Mayer from Florida.

Favonia octonema, P. & L., p. 328, Arnhem Land; Blainville, pl. 40, fig. 1. Haeckel (p. 94) referred this species to *Nemopsis* and called it *Nemopsis favonia*. According to Mayer (1910, p. 173) it was probably an imperfect specimen of some species of *Lymnoria*. Another species, *Favonia hexanema* from the tropical Atlantic, was described by Péron & Lesueur (p. 328) and figured in Cuvier, pl. 52, fig. 2; this as well as the following species probably belong to the same genus as *F. octonema*, which raises a question regarding the generic name *Lymnoria*.

Lymnoria triedra, Péron & Lesueur, p. 329, Bass Strait on the south coast of Australia; Blainville, pl. 40, fig. 2; Cuvier, pl. 52, figs. 1, 1*a*. Haeckel (p. 87) changed the specific name to *proboscidea*. Mayer (1910, p. 153) is inclined to identify this species with *Lymnoria ocellata* Agassiz & Mayer, which was found at Makemo Island, Paumotus, in the South Pacific.

In Haeckel's monograph *L. triedra* was still the only species of *Lymnoria*, but he erected a new genus, *Thamnostoma* for two species, *dibalia* Busch, 1851, and *macrostoma* n. sp., in which the number of marginal tentacles was only eight.

Mayer (1900*a*, p. 6, pl. 5, figs. 16–18) described a new species, *Lymnorea borealis* from the coast of Maine and referred it without comment to *Lymnoria*, and later on he added two more species, *L. ocellata* Agassiz & Mayer (1902) from the Paumotus in the Pacific and *L. alexandri* Mayer (1906) from the Bahamas and Florida. It is difficult to understand why Mayer should regard these species as congeneric with *L. triedra* Péron & Lesueur, as this

species (together with the somewhat similar two species of *Favonia*) is absolutely unrecognizable, though almost certainly entirely different from any of the new species he himself described. Bigelow (1909, p. 192) took this view and ignored *L. triedra* P. & L. as unrecognizable. But he retained the generic name *Lymnorea* with Mayer as the author, *non* Péron & Lesueur, and suggested *L. alexandri* Mayer as the type-species. Mayer (1910, p. 153) further included Haeckel's two species of *Thamnostoma* in the genus *Lymnorea*.

Hartlaub (1911, p. 226) called attention to the fact that Mayer had not distinguished between true oral tentacles inserted above the mouth and mere dilatations (branched or unbranched) of the mouth lips, such as are present in *Podocoryne*. Rees (1938, pp. 22–25) reinstated the genus *Thamnostoma* Haeckel for species with solitary marginal tentacles and four branched oral tentacles above the mouth and so, since all species with solitary marginal tentacles and with four simple or branched mouth-lips armed with nematocyst clusters are referable to *Podocoryne*, the generic name *Lymnoria*, applicable only to the unrecognizable *L. triedra*, virtually disappears.

The following three medusae evidently belong to the genus *Aequorea*, but their specific identity cannot be determined:

Aequorea eurodina, P. & L., p. 336, Bass Strait.
Aequorea cyanea, P. & L., p. 337, Arnhem Land ; Blainville, pl. 32, figs. 2, 2*a*.
Aequorea thalassina, P. & L., p. 337, Arnhem Land.

Haeckel (p. 222), who had seen Lesueur's original figures, united the two latter species under the name of *A. thalassina*. Mayer (1910, p. 326) placed them together with *A. eurodina* as doubtful synonyms of *A. forskalea* ; as, however, all of them are stated to have the same number of tentacles as of radial canals, they can hardly belong to that species.

The following three species are doubtfully referable to *Zygocanna* :

Aequorea purpurea, P. & L., p. 337, Endracht's Land, western Australia ; figured in Cuvier, pl. 43, figs. 3, 3*a*. The figure shows no bifurcation of the radial canals, but from the description we may presume that the 24 radial canals issue in pairs from the 12 " bandelettes à l'estomac," so that its affinity to *Zygocanna* seems probable.

Aequorea pleuronota, P. & L., p. 338, Arnhem Land. Mayer (1910, p. 338) may be right that *Zygocanna costata* Haeckel (1879, p. 214) from the coast of New Guinea is the same species. Mayer designated *pleuronota* as the type-species of *Zygocanna*, which is regrettable, since its identity remains doubtful and it was really for *costata* that Haeckel established his new genus *Zygocanna*.

Aequorea undulosa, P. & L., p. 338, Arnhem Land ; *Zygocannula undulosa* Haeckel (p. 217). Mayer (1910, p. 339) makes it a synonym of *Zygocannula diploconus* Haeckel from the Sunda Strait, and in this case he assigns the priority to Haeckel's species and not to Péron's At any rate the identity remains doubtful.

Pegasia cylindrella, P. & L., p. 341, Arnhem Land ; Haeckel (p. 331), who had seen Lesueur's unpublished figure, was probably right that this was an *Aglaura*.

(*Pegasia dodecagona*, P. & L., p. 341, was certainly a Narcomedusa, and Haeckel made it the type-species of *Petasia*. Blainville (1834, p. 281) records it as an Australian species, but it was found in the southern Atlantic, " Océan Atlantique Austral ")

Melicerta pleurostoma, P. & L., p. 353, De Witt's Land in north-western Australia. Haeckel (p. 67) referred this species to *Turritopsis*, and Mayer (1910, p. 146) indicates the possibility that it might be identical with *Turritopsis lata* Lendenfeld. It was, however, a

much larger medusa, 20–40 mm. The description gives no conception of a *Turritopsis*, but the unpublished figure by Lesueur induced Haeckel to place it in that genus. I even doubt if it be an Anthomedusa and prefer to leave it as *incertae sedis*.

Thus, unfortunately, of the 20 species of Australian Hydromedusae described by Péron & Lesueur, only two (*Eudora undulosa* and *Pegasia cylindrella*) can, with some degree of probability, be identified; three are doubtful (*Berenix thalassina*, *Aequorea pleuronota* and *Aequorea undulosa*) and the remaining 15 are unrecognizable.

Quoy & Gaimard (1824, in Freycinet, Voyage autour du monde de l'Uranie, etc., p. 566, pl. 84, fig. 2) described one medusa from Australia, *Dianaea endrachtensis*; Haeckel (1879, p. 295) called it *Geryonia dianaea*. It was most probably identical with *Geryonia proboscidalis* (Forskål), which is the only species of this genus. It was found off Endracht's Land in Western Australia.

From another circumnavigation R. Lesson (1830, p. 130, pl. 14, figs. 5, 5′) gave a vague description of a medusa taken on the coast of New Guinea, *Microstoma ambigua*. Lesson himself (1843, p. 295) was in doubt of its affinity. Haeckel (1879, p. 102) referred it to his genus *Pteronema*, and according to Mayer (1910, p. 92) it may possibly be identical with *Pteronema darwini* Haeckel, which is also an Australian medusa.

Haeckel, in his well-known monograph (1879), has described nine Australian Hydromedusae, all of them new species, collected partly by Dr. Faber, partly by Captain Weber. One of the species differs in no way from *Geryonia proboscidalis*, another is doubtful (*Aeginura myosura*), and the remainder may be valid species that have not been observed since they were described by Haeckel. Two species are from the coast of New Guinea, but, for the others, the locality is given only as " coast of Australia," without further details.

Dicodonium dissonema (p. 27) was not figured; it seems to differ from the other species of this genus by its very large tentacle bulbs.

Pteronema darwini (p. 101, pl. 7, figs. 1, 2) is a most peculiar medusa, and it would be highly desirable to see it again.

Dissonema saphenella (p. 126, pl. 8, fig. 3) was placed by Haeckel among the " Thaumantidae," but Mayer (1910, p. 115) is probably right in considering it to be an Anthomedusa of the family Pandeidae. If the description is correct it differs from the only other species of the genus (*D. turrida* Mayer, from Florida and the Bahamas) by the umbrella margin being destitute of any kind of appendages.

Cladocanna polyclada (p. 161) from New Guinea is probably a *Toxorchis*. Mayer (1910, p. 228) regards it as a synonym of "*Berenix thalassina*" Péron & Lesueur (see above), but as this is a doubtful species, it seems to me better to retain Haeckel's specific name and provisionally to regard *Toxorchis polyclada* as a valid species.

Eutimalphes pretiosa (p. 195, pl. 11, fig. 8) is a large and apparently very beautiful medusa. Mayer (1910, p. 305) refers it to *Eutima*, and according to the usual definition of this genus it does belong there. It differs, however, considerably from all the other species by its very broad peduncle, the enormous size of its complexly folded lips, and by the curtain-like gonads, which occupy nearly the whole length of the radial canals without interruption at the basal portion of the peduncle. The only specimen was somewhat mutiliated, and the description may, therefore, be not quite reliable. The genus *Eutimalphes* was erected by Haeckel for this species, also to include "*Tiaropsis indicans*" Romanes, which, however, is destitute of cirri, and was long ago removed from *Eutima* and *Eutimalphes* and made the type-species of the genus *Eutonina*. Bigelow (1909, p. 166)

points out the resemblance of *Eutimalphes pretiosa* to the species of *Tima*, but as Haeckel expressly states that his medusa has only eight marginal vesicles, it would be premature to refer it to *Tima*. Provisionally I think we should retain the generic name *Eutimalphes* for the Australian medusa, its affinities remaining doubtful.

Zygocanna costata (p. 214, pl. 15, figs. 7, 8), found off New Guinea. As mentioned above it seems to me uncertain whether this can be identified with *Aequorea pleuronota* Péron & Lesueur. Haeckel's species should be retained and regarded as the type-species of *Zygocanna*.

Stauraglaura tetragonima (p. 277, pl. 16, figs. 10, 11) may be an *Aglaura hemistoma*, in which four of the normal eight gonads have not been developed. Haeckel contradicts the supposition that four gonads might have fallen off, because in both specimens at his disposal the four globular gonads were close together; but if four of the gonads were retarded in their development, the remaining four might well expand laterally so as to come into contact with each other.

Carmaris giltschi (p. 296, pl. 18, fig. 8) is identical with *Geryonia proboscidalis*.

Aeginura myosura (p. 343, pl. 19, figs. 8, 9) was originally described from the coast of Australia (this seems to have escaped the attention of Mayer, 1910, p. 468); another specimen was taken by the "Challenger" in deep water south of Australia and described by Haeckel (1881, p. 41, pls. 13 and 14, figs. 1–12). Bigelow (1938, p. 132, and 1940, p. 309) has discussed the species of *Aeginura* and is very much inclined "to treat Haeckel's old names as doubtful synonyms of *grimaldii*."

Cannota dodecantha Haeckel (p. 151) was taken at "Nieder Guinea." It is a mistake, therefore, for Lendenfeld (1884, p. 600) and Mayer (1910, p. 221) to mention it as occurring in New Guinea.

The only special account of Australian medusae is that given in a series of papers, 1883–87, by R. von Lendenfeld, who collected 15 species of Hydromedusae on the coast of New South Wales and described them all as new species.

It is generally understood that Lendenfeld's descriptions are unreliable and most of his species unrecognizable, and, unfortunately, this is not far from being true. It was a disappointment, therefore, when in 1951 I had the great pleasure of visiting the Australian Museum in Sydney to find that Lendenfeld's collection was not there. Some years ago, however, I saw some of his original specimens in the British Museum, London, and I found that his descriptions, though brief and insufficient, are fairly correct, whereas the figures are utterly wrong and misleading.

In 1883 (p. 497, pl. 27–32) Lendenfeld described the abortive medusa of a campanularian hydroid, *Eucopella campanularia*, from the southern coasts of Australia. Mayer (1910, p. 233) may be right that the hydroid is identical with *Campanularia bilabiata* Coughtrey from New Zealand.

The following of Lendenfeld's species are so vaguely described that they will probably never be recognized:

Sarsia radiata (1884, p. 583, pl. 20, figs. 31, 32).

Sarsia minima (1884, p. 584, pl. 21, figs. 34, 35; 1885, p. 915). Some specimens are in the British Museum; they are embedded in Canada balsam and mounted on a slide, and it is impossible to discern their structure.

Euphysa australis (1884, p. 586, pl. 21, fig. 33).

Pennaria rosea (1884, p. 594, pl. 24, figs. 40–42).

Pennaria adamsia (1884, p. 595, pl. 25, figs. 43–48, pl. 26, fig. 49).

Pandea minima (1885, p. 916, pl. 42, figs. 10–12).

Obelia australis (1885, p. 920, pl. 43, figs. 19–22). First described from the east coast of New Zealand, 1884, p. 604.

The following species present certain characteristic structures which may possibly in future lead to their recognition, if specimens of similar appearance are found :

Lizusa prolifera (1884, p. 589, pl. 23, figs. 38, 39). This seems to be a *Bougainvillia* with medusa buds on the manubrium and with unbranched oral tentacles ; it may possibly be a juvenile stage.

Tiaropsis macleayi (1884, p. 605, pl. 23, fig. 37). There is a faint possibility of this species belonging to the Mitrocomidae ; but nothing is said as to whether the eight statocysts are open or closed, only that they are large, and nothing about ocelli at the base of the statocysts. On the other hand, some of the numerous marginal tentacles are said to have a basal ocellus.

Mitrocomium annae (1884, p. 606, pl. 29, figs. 58–60). Mayer (1910, p. 290) referred this species to *Mitrocoma*, and changed the specific name to *lendenfeldi* in order to distinguish it from *Mitrocoma annae* Haeckel. Lendenfeld's medusa is very similar to *Mitrocomium cirratum* Haeckel. In a previous paper (Kramp, 1932, p. 320) I have stated that *M. cirratum* has closed statocysts and accordingly does not belong to the Mitrocomidae. Later on I came to the conclusion that this Mediterranean medusa belongs to the genus *Eucheilota*. The tropical Atlantic *Eucheilota multicirrata* Thiel (1938) is the same species. It seems to me highly probable that *Mitrocomium annae* Lendenfeld is likewise an *Eucheilota*, but it does not agree with any of the two species of that genus described by me in the present paper. (p. 270). Lendenfeld found five specimens at Port Jackson, and in this case his description seems sufficient to recognize the species, if more specimens are found.

Margelis trinema (1885, p. 918, pl. 41, fig. 13). As mentioned above (p. 264) it seems to me improbable that this is the young of *Bougainvillia fulva* as supposed by Mayer (1910, p. 171).

Some of the original specimens of the following three species are in the British Museum, London, where I have seen them :

Turritopsis lata (1884, p. 588, pl. 22, figs. 36, 36*a*) : This is a valid species distinct from *T. nutricula* but certainly belonging to the same genus. What is stated in Lendenfeld's description is correct, but the vacuolated endoderm cells characteristic of *Turritopsis* are not mentioned, and it is mainly in the extension of this vacuolization that *T. lata* differs from the other species. The large stomach is mounted on a short, broad peduncle, which is gelatinous, and vacuolated endoderm cells are only present in the proximal parts of the 4 radial canals from the upper wall of the stomach to the base of the peduncle ; the vacuolated parts of the radial canals are funnel-shaped, tapering upwards, and fairly narrow, without the broad lateral extensions characteristic of *T. nutricula*, and they are attached to the gelatinous peduncle by narrow lines, in which the cells are not vacuolated. *T. lata* was very abundant at Port Jackson in March-April, and it should be possible to find it again.

Octorhopalon fertilis (1885, p. 919, pl. 42, figs. 14, 15) : Mayer (1910, p. 206) refers this species to *Laodicea* with some hesitation. The specimen in the British Museum has been dried, but I was able to see that Lendenfeld's description is not bad, though very insufficient.

The figures are absolutely misleading. The eight marginal " clubs " are typical cordyli. very large and broad, though not larger than the interradial tentacle bulbs. As far as I was able to see, the tentacle bulbs have no abaxial spurs. The stomach and the gonads are as in a *Laodicea*, and the medusa must probably be referred to that genus. In spite of the small size of the specimen. 2 mm. in diameter and 2·5 mm. in height, the gonads are rather well developed, and the specimen cannot be regarded as a young stage. Apparently it must provisionally be retained as a good species of *Laodicea*.

Eucope hyalina (1885, p. 920, pl. 42, figs. 16–18) : The figure of the entire medusa is utterly wrong and misleading, but the description is not quite so bad. There are two specimens in the British Museum ; one of them is fairly well preserved, the umbrella is exactly as high as wide, the manubrium very short, about one-fourth the height of the bell cavity : the four interradial tentacles are undeveloped, the basal bulbs of the four perradial tentacles are almost cylindrical, not conic as stated by Lendenfeld. In the other specimen, which is somewhat smaller, the umbrella is likewise at least as high as wide, but it is somewhat crumpled. The interradial tentacles are developed, their basal bulbs about half as large as the perradial. The filiform part of the tentacles is retained, provided with rings of nematocysts. The eight statocysts are distinct, but I could not see whether they are surrounded by " long ciliae." This is evidently a *Phialella*, a genus which highly needs a revision, and provisionally I think we should retain *Phialella hyalina* (Lendenfeld) as a proper species.

Mayer (1915) has given a short account of some medusae collected at Murray Islands, Torres Strait ; six species of Scyphomedusae and 10 species of Hydromedusae are recorded. Some of them are only listed (p. 160), others are mentioned again later on :

Cytaeis atlantica (p. 200, pl. 1, fig. 2) is *C. tetrastyla* (see p. 263).

Stomotoca turrida (p. 199, pl. 1, fig. 1) really seems to be identical with *Amphinema turrida* (Mayer), previously known from Florida, the Bahamas, and the Pacific coast of Mexico, and recorded from Japan by Uchida (1938). It is not the same species as *A. dinema*, which I have mentioned above.

Laodicea fijiana (p. 200).—The specimens collected in the Torres Strait undoubtedly belong to *L. indica* (see above, p. 269).

Phialidium pacificum (p. 201, pl. 2, fig. 3). The original specimens from the Fiji Islands (Agassiz & Mayer, 1899), which were 6 mm. in diameter, had 16 tentacles, two statocysts between each successive pair of tentacles, and eight mouth-lips ; the specimens from Torres Strait, up to 5 mm. wide, had 43 tentacles, but only 26 statocysts, and the mouth had only four lips. It seems improbable, therefore, that they belong to the same species. On the other hand, they do not agree with any of the species of *Phialidium* found on the Great Barrier Reef and mentioned by me in the present paper, and I cannot refer them to any known species.

Eutima australis (p. 201, pl. 3, fig. 5) is described as a new species. As mentioned above (p. 289), it is probably identical with *E. curva* Browne, which was found on the Great Barrier Reef.

Aequorea macrodactyla is only mentioned in the list (p. 160) without comments.

Rhopalonema velatum (p. 202, pl. 2, fig. 4).

Aglaura hemistoma, only mentioned in the list (p. 160).

Liriope rosacea, likewise in the list (p. 160), is identical with *L. tetraphylla*.

Solmundella mediterranea (p. 160) is most certainly *S. bitentaculata*.

Considering the rich collection brought home by the Great Barrier Reef Expedition it seems strange that Mayer (p. 160) emphasizes " the poverty of the Great Barrier Reef of Queensland and the southern coast of Papua, east of Torres Strait."

Since that time I have found only a few scattered remarks on Australian Hydromedusae in the literature.

Cnidonema haswelli, a new crawling medusa, was described by Briggs (1920, p. 97, pl. 17, figs. 1–4, pl. 18, figs. 1–5). It is closely related to *Staurocladia capense* (Gilchrist, 1919) from Cape of Good Hope and *Staurocladia vallentini* (Browne, 1902), originally described from the Falkland Islands (further mentioned by Browne & Kramp, 1939, p. 277), and later recorded from the Bermudas and from Wellington, New Zealand (Ralph, 1947).

Neoturris pelagica (Agassiz & Mayer, 1902) was recorded by Kramp (1928, p. 55) from south-eastern Australia, 38° 05′ S., 149° 45′ E.; originally described from the Pacific coast of Lower California and also recorded from Vancouver Island (Foerster, 1923).

Olindias singularis Browne was recorded by Stiasny (1931, p. 27) from Michaelmas Reef, off Cairns, Queensland.

Obelia sp.: During their investigations of the marine plankton in the coastal waters of New South Wales, Dakin & Colefax (1933, p. 198) found only one species of Hydromedusae, an *Obelia*, which could not be specifically identified.

Finally, the original description of *Aequorea australis* Uchida (1947, p. 307, text-fig. 8) was based on specimens from northern Australia and New Guinea.

ZOOGEOGRAPHICAL REMARKS.

Forty-four species of Hydromedusae were collected by the Great Barrier Reef Expedition; two of them are undetermined (*Eucheilota* sp. I and II); three are described as new species: *Octotiara russelli*, *Phialucium condensum*, and *Eirene menoni*; the last had previously been found on the coasts of India and China.

Halicreas minimum is a bathypelagic, holoplanktonic medusa with an almost cosmopolitan distribution; it was taken in one haul over deep water outside the reefs.

Eight species are holoplanktonic and occur mainly in the upper strata. One of them, *Solmaris rhodoloma*, is only known from the Pacific (southern Japan and Chile, probably also at the Pelew Islands). *Amphogona apsteini* occurs across the tropical parts of the Indian and Pacific Oceans but is not known from the Atlantic. The remaining six species are circumtropical, widely distributed in the tropical, partly also in the subtropical, belts of all the great oceans including the Mediterranean: *Rhopalonema velatum*, *Aglaura hemistoma*, *Geryonia proboscidalis*, *Liriope tetraphylla*, *Solmundella bitentaculata*, and *Cunina octonaria*.

The distribution of the thirty meroplanktonic species (Anthomedusae, Leptomedusae and Limnomedusae) is seen from Table XV. They may be divided into the following groups according to their further distribution:

I. Four species mainly occurring in northern waters, but also known from several localities in the Tropics. They all occur in the Mediterranean. *Amphinema dinema* has not previously been recorded from the Pacific, but the other species occur in all the great oceans.

TABLE XV.—*Further Distribution of Meroplanktonic Species of Hydromedusae found on the Great Barrier Reef.*

	Indian Ocean.			Pacific Ocean.		Atlantic Ocean.		Mediterranean.
	W.	C.	E.	W.	E.	W.	E.	
I. *Zanclea costata*	×	×	×	×	×	×	×	×
Leuckartiara octona	–	×	×	×	×	×	×	×
Phialidium hemisphaericum	–	×	×	×	–	×	×	×
Amphinema dinema	?	×	–	–	–	×	×	×
II. *Cytaeis tetrastyla*	×	×	×	×	×	×	×	×
Proboscidactyla ornata	–	×	–	×	×	×	×	?
Merga violacea	–	×	–	–	×	×	–	×
Aequorea macrodactyla	×	×	×	×	×	–	×	–
Phialucium carolinae	–	×	×	×	–	×	–	–
III. *Euphysora bigelowi*	×	×	×	×	×	–	–	–
Bougainvillia fulva	×	×	×	×	×	–	–	–
Eirene hexanemalis	×	×	×	×	–	–	–	–
Eirene palkensis	×	×	×	×	–	–	–	–
Aequorea pensilis	×	×	×	×	–	–	–	–
Olindias singularis	×	×	×	×	–	–	–	–
Eutima levuka	–	×	×	×	–	–	–	–
Heterotiara minor	–	–	×	×	–	–	–	–
Phialucium mbenga	–	?	×	×	–	–	–	–
Eirene ceylonensis	–	×	×	×	–	–	–	–
IV. *Laodicea indica*	×	×	×	–	–	–	–	–
Helgicirrha malayensis	–	×	×	–	–	–	–	–
Aequorea conica	–	×	×	–	–	–	–	–
Eutima curva	–	×	–	–	–	.	–	–
Aequorea australis	–	–	×	–	–	–	–	–
Euphysora annulata	–	–	×	–	–	–	–	–
Leuckartiara gardineri	×	–	–	–	–	–	–	–
V. *Phialucium rangiroae*	–	–	–	×	–	–	–	–
Eirene kambara	–	–	–	×	–	–	–	–
VI. *Cirrhitiara superba*	–	–	–	–	–	×	–	–
Phialidium simplex	–	–	–	–	–	×	–	–

Twenty-four species are only known from tropical, or partly also from sub-tropical seas.

II. Five species more or less widely distributed in the Atlantic as well as the Indian and Pacific Oceans; two or three of them also known from the Mediterranean.

III. Ten species unknown in the Altantic and the Mediterranean, but occurring in the Indian Ocean and in the western parts of the Pacific; two of them also recorded from

the eastern Pacific. Four of the species have not yet been found in the western parts of the Indian Ocean.

IV. Seven species only known from the Indian Ocean, mainly from its eastern parts, now for the first time found in the western Pacific.

V. Two species only known from the western Pacific (Paumotus and Fiji Islands).

VI. Two species hitherto known only from a few localities in the Atlantic, one of them, *Cirrhitiara superba*, from the tropical West-Atlantic, the other one, *Phialidium simplex*, from the southern West-Atlantic.

As might be expected, the fauna of Hydromedusae occurring in the Great Barrier Reef area has a predominantly tropical character. If we exclude the four species of the groups V and VI, which are only known from a few scattered localities, we find that among the remaining 26 species only six or seven occur in the Mediterranean, eight in the Atlantic, and likewise only eight in the eastern Pacific, whereas 17 have previously been recorded from the western Pacific. Twenty-three were known from the eastern part of the Indian Ocean, 21 or 22 from the central and 12 or 13 from the western part of the Indian Ocean.

Thus the fauna on the Great Barrier Reef is not merely tropical, but also distinctly Indo-West Pacific. It must be admitted that our knowledge of the medusae on the west coast of South America is insufficient, but we know something about the faunas off the Californian and Mexican coasts, and it is striking that, apart from the species which also occur in the Atlantic, only two of the Great Barrier Reef species are known from the eastern Pacific. This accords with the contrast, pointed out by Ekman (1934), and illustrated by numerous examples, between an Indo-West Pacific and an Atlanto-East Pacific fauna of littoral warm-water animals.

TABLE XVI.—*Number of Species of* Hydromedusae *in each Month.*

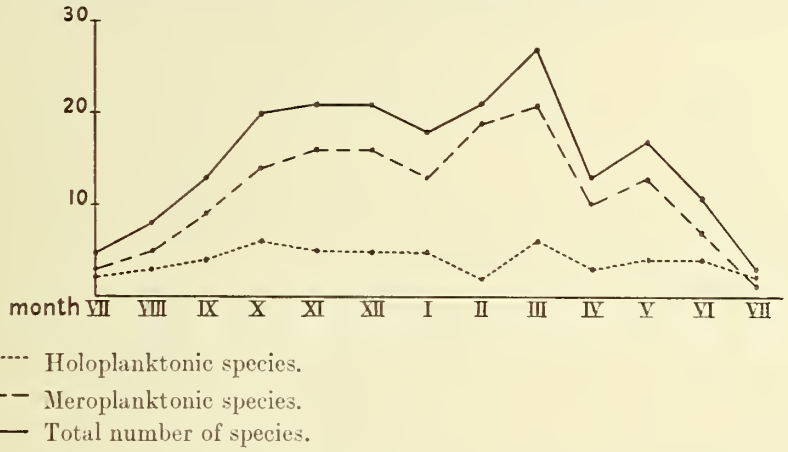
	1928.						1929.							
Month . .	VII.	VIII.	IX.	X.	XI.	XII.	I.	II.	III.	IV.	V.	VI.	VII.	Total.
Holoplanktonic species	2	3	4	6	5	5	5	2	6	3	4	4	2	9
Meroplanktonic species	3	5	9	14	16	16	13	19	21	10	13	7	1	35
Total number of species .	5	8	13	20	21	21	18	21	27	13	17	11	3	44

REMARKS ON SEASONAL OCCURRENCE.

Rare species are not included in Table XVIII, but in Table XVI and the accompanying curves (Text-fig. 8) the actual numbers of species of Hydromedusae found in each month during the investigations in the Great Barrier Reef area are given. The total number of holoplanktonic species was nine and, as will be seen from the table, the variation in the number of species during the year was very slight; the temporary decrease in February may be due to the heavy rainfall in this month, which lowered the salinity of the upper strata; hydrographical and meteorological conditions may have prevented or diminished the influx of oceanic water at this time.

On the other hand, the meroplanktonic species showed a remarkable increase in number from July (only three species found) to March the next year (21 species), followed by a somewhat more rapid decrease. On the whole the number of species was fairly

constant during a period of about six months of the summer. In North-European waters the occurrence of Hydromedusae is divided into two more or less sharply separated periods, some species predominating in spring, others in autumn, the former mainly belonging to northern seas, the latter mainly with a southern distribution.



Text-fig. 8.—Number of species of Hydromedusae in each month.

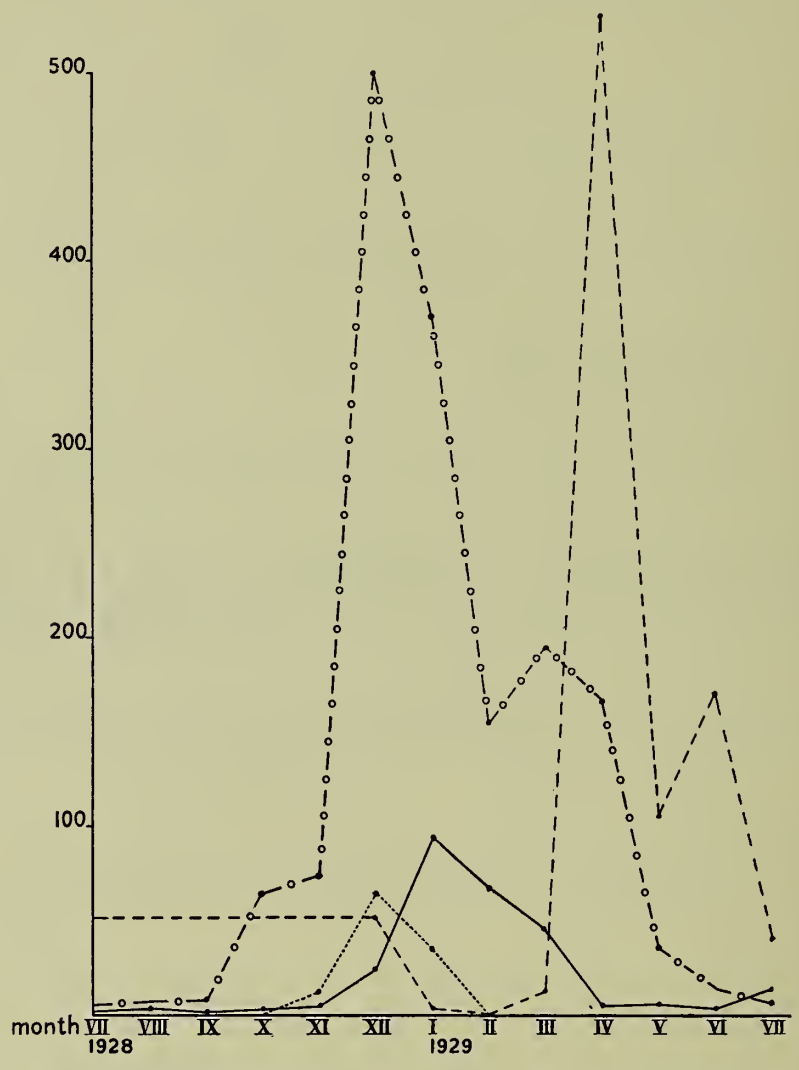
As mentioned in the Introduction (p. 260), an exact enumeration of the number of specimens of each species caught by the investigations is not possible, because only parts of the samples were sorted for identification; but an approximate calculation may give some idea of the quantities at different seasons of some of the most common species. Such calculations have been carried out for six meroplanktonic species, and for the Narcomedusa, *Cunina octonaria*, which together with the Trachymedusae *Aglaura hemistoma* and *Liriope tetraphylla*, constitutes the vast majority of the holoplanktonic species. Table XVII and

Table XVII.—*Estimated Average Number of Specimens of* Hydromedusae *per Haul with 1 m. Stramin-net and Coarse Silk Net in each Month.*

	1928.						1929.						
Month.	VII.	VIII.	IX.	X.	XI.	XII.	I.	II.	III.	IV.	V.	VI.	VII.
Aglaura hemistoma	22	60	6	65	5	70	3	0·1	11	530	105	170	40
Liriope tetraphylla	1	2	1	2	5	23	95	68	46	5	6	3	13
Cunina octonaria	0	1	0·1	0·3	12	66	36	0	0	0	1	1	0
Other medusae	4	7	7	65	74	500	370	155	195	166	36	14	7
Total	27	70	14	132	96	659	504	223	252	701	148	188	60

the curves (Text-fig. 9) illustrate the seasonal occurrence of these three species compared with that of all the other species together. The table only includes the catches taken with the stramin-net and the coarse silk net; moreover the samples taken outside the reefs have been omitted. It will be seen that although the holoplanktonic medusae occurred at all seasons, they varied considerably in numbers at different times. During the first six months, July–December, 1928, *Aglaura* was the subject of considerable variations;

the average number per haul in this period was 51, and for the sake of simplicity this figure has been used in the diagram, Text-fig. 9. The species was accordingly rather common during that period, whereas it was very rare during the following three months; but then it suddenly increased enormously in numbers, the average for April being 530; one haul (St. LV, C) even contained 1,600 specimens. *Liriope* had its maximal occurrence



TEXT-FIG. 9.—Estimated average number of specimens in each month.

during the period when *Aglaura* was rare, *Cunina* one month earlier. These three holoplanktonic species thus behaved rather differently.

The other species, the majority of which are meroplanktonic, were rare in winter, May–September, but abundant in summer; the very large number in December was mainly due to the great quantities of *Laodicea indica*. As mentioned above (p. 234) *Bougainvillia fulva* was entirely absent outside the period January–May, whereas the other common

species occurred almost throughout the year, though with distinct periods of maximal occurrence. *Phialucium carolinae* had two maxima, December–January and June. The maxima of *Laodicea indica, Eirene hexanemalis, Helgicirrhia malayensis* and *Aequorea australis* were in December or January. Most of the less common species likewise had their principal time of occurrence during the summer, though some of them might also be taken at other seasons, and for all the common species and several of the others it has been demonstrated that young specimens occurred at any time. So, with few exceptions, medusae are liberated from the hydroids throughout the year, but with a distinct maximal periodicity, usually in summer.

A. P. Orr (1933) has discussed the biological significance of the physical and chemical conditions as observed on the Great Barrier Reef Expedition (p. 61) and called attention to the different circumstances which might be expected to affect the occurrence of the planktonic animals. The fluctuations in the salinity of the water were not great, there being only a temporary summer-time reduction, caused by rainfall. The amount of phytoplankton is only of indirect importance for carnivorous animals like medusae, and from the paper by Russell & Colman (1934) it appears that copepods, molluscs, echinoderm larvae and other pelagic animals are always present in considerable numbers throughout the year. The reason for the distinct increase in production of meroplanktonic Hydromedusae during the summer must evidently be the temperature. In comparison with northern waters the fluctuations in temperature were certainly slight, the annual range being only 8·6° C., from 21·24° in July to 29·88° in February at a depth of 28 m. Nevertheless this difference in the temperature of the water seems to affect these tropical species of medusae to a remarkable degree ; the comparatively low temperature in winter does not completely stop the production, but the high summer temperature causes a great increase in productivity.

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TABLE XVIII.—*List of Stations where* Hydromedusae *were Collected, with Number of Specimens in the Preserved Collection.*

Station number.	Date.	Position.	Depth (m.)	Temp. (° C.)	Net.	*Euphysora bigelowi.*	*Cytaeis tetrastyla.*	*Bougainvillia fulva.*	*Merga violacea.*	*Amphinema dinema.*	*Leuckartiara octonu.*	*Laodicea indica.*	*Phialidium hemisphaericum.*	*Phialidium simplex.*	*Phialucium mbenga.*	*Phialucium carolinae.*	*Eirene hexanemalis.*	*Helgicirrha malayensis.*	*Eutima levuka.*	*Eutima curva.*	*Aequorea australis.*	*Aequorea macrodactyla.*	*Aequorea penicillis.*	*Amphogona apsteini.*	*Aglaura hemistoma.*
1	1928. 27.vii	2 miles N.E.	31	21°90	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
					C	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	4
2	30. „	3 miles E.	„	22°58	S	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	2	–	–	–	1
					C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	4
3	4.viii	„	32	22°28	S	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	11	–	–	–	–
					C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–
4	7. „	1 mile N.	16	„	C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
5	11. „	3 miles E.	32	21°52	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9
					C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12
					F	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9
6	17. „	„	„	„	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	39
					C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	29
7	22. „	„	„	22°42	S	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	4
					C	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10
8	27. „	I.T.O.	45	23°22	S	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	4
					C	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	3
9	31. „	3 miles E.	32	23°00	S	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	7
					C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	6
10	4.ix	„	„	23°45	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–
					C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	2
11	6. „	I.T.O.		23°91	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–
					C	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–
					N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
12	11. „	3 miles E.	32	24°13	S	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	5
					C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12
	19. „	R.F.			C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5
13	20. „	3 miles E.	„	24°53	S	–	–	–	–	–	–	10	1	–	–	–	–	1	1	8	–	–	–	–	–
					C	–	–	–	–	–	–	5	–	–	–	–	–	–	–	4	–	–	–	–	1
					F	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	–	2
14	26. „	„	„	25°11	S	–	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–
	28. „	R.F.			C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
15	2.x	3 miles E.	„	25°10	S	–	–	–	–	–	–	1	–	–	–	1	–	–	–	–	3	–	–	–	2
					C	–	–	–	–	1	–	7	–	–	–	–	–	1	1	–	5	1	–	–	23
					F	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	2	11
					m. wire																				
16	3.„	„	„	–	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
					10	–	3	–	–	–	–	–	–	–	–	–	–	–	1	–	3	–	–	–	–
					20	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–	2	2	–	–	98
					30	–	1	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–
					40	–	1	–	–	–	–	1	–	–	–	–	–	–	5	2	1	–	–	–	–
					25	–	1	–	–	–	–	3	–	–	–	–	–	–	2	–	–	–	–	–	8
17	8.„	„	„	25°40	S	–	–	–	–	–	–	1	–	–	–	–	1	–	1	–	1	–	–	–	5
18	15.„	„	„	25°93	S	–	–	–	–	–	1	–	–	–	–	4	3	–	–	–	9	–	–	–	–
					C	–	–	–	–	–	1	–	–	–	–	1	–	1	2	–	1	–	–	–	5
					F	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	3	17
19	20.„	O.T.O.	225	26°05	S 180–0	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	2
					N „	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	7
					N „	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5
20	„ „	„	>600	–	N 250–0 m.	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–
21	22.„	3 miles E.	32	–	S	–	–	–	–	–	–	2	–	–	–	–	1	–	–	–	–	–	–	–	4
					C	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	–	1	16
					F	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10
22	23.„	„	„	26°50	S	–	–	–	–	–	–	2	–	–	–	–	–	–	1	–	–	–	–	–	9
					C	–	–	–	2	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
23	2.xi	„	„	27°24	S	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1	1	–	–	18
					C	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	37
24	6. „	„	„	27°33	S	–	–	–	–	–	–	5	–	–	–	–	2	–	–	3	4	1	–	–	2
					C	–	–	–	–	–	1	2	–	–	–	–	–	–	1	3	1	–	–	–	15

TABLE XVIII.—*List of Stations where* Hydromedusae *were Collected, with Number of Specimens in the Preserved Collection.*—Continued.

Station number.	Date. 1928.	Position.	Depth (m.)	Temp. (° C.)	Net.	*Euphysora bigelowi.*	*Cytaeis tetrastyla.*	*Bougainvillia fulva.*	*Merga violacea.*	*Amphinema dinema.*	*Leuckartiara octona.*	*Laodicea indica.*	*Phialidium hemisphaericum.*	*Phialidium simplex.*	*Phialucium mbengu.*	*Phialucium carolinae.*	*Eirene hexanemalis.*	*Helgicirrha malagensis.*	*Eutima levaka.*	*Eutima curva.*	*Aequorea australis.*	*Aequorea macrodactyla.*	*Aequorea pensilis.*	*Amphogona apsteini.*	*Aglaura hemistoma.*	*Liriope tetraphylla.*	*Canina octonaria.*
25	16.xi	3 miles E.	32	26°57	S	–	–	–	–	2	–	–	–	–	–	5	2	–	–	–	–	1	–	–	–	–	10
					C	–	–	–	–	–	–	–	–	–	–	3	10	–	–	–	1	–	1	–	–	–	7
					?	–	–	–	–	2	–	–	–	–	–	11	6	2	1	–	1	–	–	–	–	1	4
26	19. „	I.T.O.	57	26°61	S	–	1	–	–	–	–	22	–	–	–	–	8	7	2	2	–	–	–	–	–	–	1
					C	–	3	–	–	–	–	7	–	–	–	4	2	6	–	–	1	1	–	–	–	–	3
					F	1	2	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	1	–	–	–
					N 50–0	–	1	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
27	21. „	3 miles E.	32	26°90	S	–	–	–	–	–	1	14	1	–	–	3	5	9	1	–	1	–	–	–	11	11	3
					C	–	–	–	–	–	–	3	–	–	–	–	–	4	1	–	1	–	–	–	8	1	3
					F	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	7	2	1
28	23. „	O.T.O.	>600	26°91	S 600–0	–	–	–	–	–	–	1	–	–	–	–	3	–	1	–	2	–	–	–	2	2	–
					C 580–0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
					S	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–	3	–
	25. „	L.O.R.F.	–	–	–	–	6	–	–	–	3	–	4	–	–	2	–	1	–	–	–	–	–	3	–	10	–
30	28. „	3 miles E.	32	27°34	S	–	1	–	–	–	–	13	–	–	–	5	1	2	–	–	3	–	–	–	2	9	–
30a	29. „	„	„	„	C	–	–	–	–	–	–	25	–	–	–	1	–	3	2	–	–	1	–	–	1	14	–
31	2.xii	„	„	–	B.S.	–	–	–	–	–	–	11	–	–	–	3	–	5	–	1	1	–	–	–	1	13	–
32	5. „	„	„	27°57	S	–	2	–	2	–	–	113	–	–	–	1	14	6	10	2	15	2	2	–	18	30	2
					C	–	–	–	–	–	–	23	–	–	–	–	3	–	–	1	–	–	–	–	4	4	–
33	13. „	„	„	28°17	S	–	–	–	–	–	–	3	–	–	–	20	–	19	–	–	3	–	–	–	1	1	–
					C	–	–	–	–	–	1	6	–	–	–	11	1	4	–	–	1	1	–	–	–	–	2
34	19. „	„	„	28°42	S	–	–	–	–	–	–	–	–	–	–	29	17	32	–	–	2	2	–	–	–	8	27
					C	–	–	–	1	–	3	–	–	–	–	3	3	4	–	–	1	2	1	1	2	1	7
35	27. „	„	„	29°43	S	–	2	–	3	–	–	17	–	–	–	8	44	12	1	–	25	4	3	–	7	63	7
					C	–	–	–	6	–	–	4	–	–	–	3	9	–	–	–	4	–	–	–	5	11	9
36	1929. 4.i	„	„	28°56	S	–	–	10	–	–	1	5	–	–	–	39	6	9	2	–	1	–	–	–	3	33	–
					C	–	1	–	–	–	–	1	–	–	–	4	1	–	1	–	–	–	–	–	–	8	–
37	14.„	„	31	28°47	S	–	–	–	–	–	–	1	–	–	–	2	10	3	–	–	–	–	–	–	–	16	1
					C	–	–	–	4	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	3	1
38	21.„	„	32	28°94	S	–	1	–	–	–	–	1	–	–	–	3	2	3	–	1	–	–	–	–	1	125	–
					C	–	–	–	–	–	1	–	–	–	–	1	2	–	–	–	–	–	–	–	–	51	–
39	30.„	„	31	28°89	S	–	–	–	–	–	–	–	–	–	–	20	5	4	–	–	–	–	–	–	–	20	1
					C	–	–	–	–	–	–	–	–	–	–	3	1	1	–	–	–	–	–	–	–	8	1
					F	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
41	13.ii	„	32	28°64	S	–	–	1	–	–	–	–	–	–	–	1	2	31	–	–	1	1	1	–	–	36	–
					C	–	–	–	–	–	–	–	–	–	–	–	1	16	1	–	–	–	–	–	–	13	–
42	18.„	„	„	29°00	C	–	–	1	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	4	–
43	26.„	C.B.	30	28°81	S	–	–	1	–	–	–	–	–	–	–	3	16	–	1	2	1	–	–	–	–	13	–
					C	–	–	1	–	–	–	–	–	–	–	–	8	–	1	–	–	–	–	–	–	1	–
44	27.„	Ll. I.	31	27°97	S	–	–	16	–	–	–	2	–	–	–	–	11	1	2	1	1	–	–	–	1	13	–
					C	1	–	1	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	7	–
45	28.„	O.C.P.	>600	„	S 500–0	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	2	–
46	„ „	I.C.P.	33	27°61	S	–	–	6	–	–	1	3	–	–	–	1	–	–	1	1	1	–	1	–	–	25	–
					C	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–
47	4.iii	3 miles E.	31	28°42	S	2	1	4	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	–	24	–
					C	1	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	1	–
48	15. „	„	30	28°27	S	–	–	7	–	–	–	–	–	–	–	5	13	3	–	–	–	–	–	–	1	24	–
					C	–	–	–	–	–	–	–	–	–	–	2	4	1	–	–	–	–	–	–	1	2	–
49	17. „	I.P.P.	46	28°23	S	–	1	–	–	–	1	1	–	–	2	–	3	3	–	–	–	–	–	–	–	14	–
					C	2	–	–	–	–	–	–	–	–	1	–	1	1	3	–	1	–	–	–	1	4	–
50	18. „	O.P.P.	>400	28°24	S 400–0	1	–	–	–	–	–	–	–	–	–	–	–	1	1	1	–	–	–	2	5	8	4
					S 170–0	–	–	3	–	–	–	2	3	–	1	–	–	–	–	1	–	–	1	–	1	9	1
					C 150–0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1	1	1
51	25. „	3 miles E.	33	27°68	S	–	–	15	–	–	–	–	–	–	–	15	7	–	–	–	2	–	–	–	–	3	–
					C	–	–	–	–	6	–	1	–	–	–	10	2	1	–	–	1	–	–	–	2	2	–
52	6.iv	„	32	27°62	S	–	–	–	–	–	–	–	–	–	–	10	1	2	–	–	–	–	–	1	11	8	–
					C	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	19	4	–

TABLE XVIII.—*List of Stations where* Hydromedusae *were Collected, with Number of Specimens in the Preserved Collection.*—Continued.

Station number.	Date.	Position.	Depth (m.)	Temp. (°C.)	Net.	*Euphysora bigelowi.*	*Cytaeis tetrastyla.*	*Bougainvillia fulva.*	*Merga violacea.*	*Amphinema dinema.*	*Leuckartiara octona.*	*Laodicea indica.*	*Phialidium hemisphaericum.*	*Phialidium simplex.*	*Phialucium mbenga.*	*Phialucium carolinae.*	*Eirene hexanemalis.*	*Helgicirrha malayensis.*	*Eutima levuka.*	*Eutima curva.*	*Aequorea australis.*	*Aequorea macrodactyla.*	*Aequorea pensilis.*	*Amphogona apsteini.*	*Aglaura hemistoma.*	*Liriope tetraphylla.*
53	13.iv	3 miles E.	32	26°90	S	–	–	–	–	–	–	–	–	–	–	17	1	2	1	1	2	–	–	–	8	–
					C	–	–	–	–	–	–	–	–	–	–	12	1	2	–	–	–	–	–	–	19	–
54	20. „	„	31	25°96	S	–	–	2	–	–	–	–	–	–	–	4	3	–	–	–	–	–	–	1	13	5
					C	–	–	3	–	1	–	–	–	–	–	4	–	3	–	–	–	–	–	–	20	1
55	26. „	„	„	26°52	S	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	6	–	–	–	4	8
					C	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	3	–	–	–	48	2
56	7.v	„	„	25°27	S	–	–	–	–	–	–	–	–	–	–	4	–	3	1	–	2	–	–	–	3	2
					C	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	2	1
57	18.„	„	32	24°68	S	–	–	3	–	–	–	–	–	4	–	1	–	4	–	–	3	–	–	–	13	5
					C	–	–	–	–	–	–	–	–	1	–	1	–	7	1	–	–	–	–	–	11	2
58	25.„	„	„	24°09	S	1	1	5	–	–	–	1	–	8	–	–	–	2	1	–	–	–	–	1	12	3
59	31.„	„	„	23°63	S	–	1	1	–	–	–	–	–	3	–	2	–	5	–	–	1	–	–	7	15	7
					C	1	–	–	–	1	–	–	–	2	–	–	1	1	–	–	–	–	–	–	18	1
60	7.vi	„	„	23°99	S	–	–	–	–	–	–	3	–	–	–	1	1	–	–	3	3	–	–	–	13	–
					C	–	–	–	–	–	–	1	–	–	–	–	–	–	–	3	3	–	–	–	25	2
61	14. „	„	31	22°55	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	8	1
					C	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	15	4
63	24. „	„	32	22°10	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12	–
					C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15	1
66	11.vii	„	30	21°41	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	7	6
					C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15	4
67	17. „	„	32	21°27	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	13
					C	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	13	7
		Total number of specimens				10	33	81	18	13	19	335	10	22	9	290	255	234	54	45	157	20	11	27	891	834

S : stramin net.
C : coarse silk net.
F : fine silk net.
N : Nansen net, vertical.
B.S. : bottom stramin net.

3 miles E. : 3 miles E. of Low Isles.
2 miles N.E. : 2 miles N.E. of Low Isles.
I.T.O. : in Trinity Opening.
O.T.O. : outside Trinity Opening.
Li. I. : off Lizard Island.
L.O.R.F. : lagoon over reef flat.
C.B. : off Cape Bedford.

O.C.P. : outside Cook's Passage.
I.C.P. : inside Cook's Passage.
I.P.P. : inside Papuan Pass.
O.P.P. : outside Papuan Pass.
R.F. : reef flat, entrance to anchorage, Low Isles.

EXPLANATION OF PLATES.

PLATE I.

Fig. 1.—*Octotiara russelli* n. sp. Lateral view of the medusa. × 7.

Fig. 2.—*Octotiara russelli* n. sp. Part of umbrella margin. × 25.

Fig. 3.—*Octotiara russelli* n. sp. Tentacle bulb, *cc* circular canal, *rc* radial canal. × 40.

Fig. 4.—*Phialucium condensum* n. sp. Oral view of the medusa. × 15.

PLATE II.

Fig. 5.—*Eirene kambara*. Oral view of the medusa. × 14.

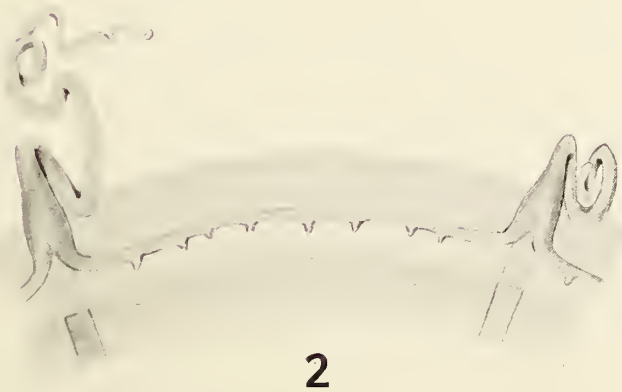
Fig. 6.—*Eirene menoni* n. sp. Lateral view of the medusa. × 6.

Fig. 7.—Stomach of *Liriope tetraphylla* with medusiferous stolons of *Cunina*. × 35.

3

1

4



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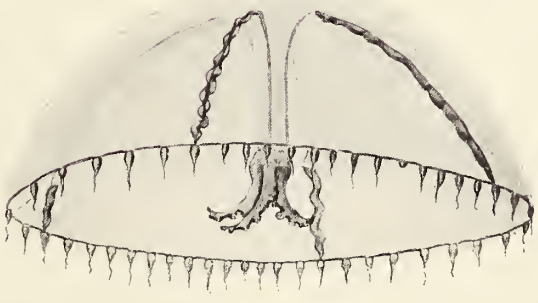

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